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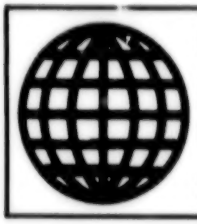

JPRS Report

Science & Technology

Central Eurasia

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Deputy Science Minister Justifies Reform Efforts

947A0017A Moscow SEGODNYA in Russian
13 Nov 93 p 11

[Interview with Doctor of Economic Sciences and Russian Federation First Deputy Minister of Science and Technical Policy Andrey Georgiyevich Fonotov, by Svetlana Fedorovich, under the rubric "Opinions"; place and date not given: "Andrey Fonotov: The Primary Thing Under Present Conditions Is To Create a New Institutional Environment"—first paragraph is SEGODNYA introduction]

[Text] Andrey Georgiyevich Fonotov was born in 1947 in Leningrad. He graduated from the Economics Faculty of Moscow State University imeni Lomonosov. He is a doctor of economic sciences. For a long time he worked at the TsEMI (Central Institute of Mathematical Economics, where Glazyev, Gaydar, and Shatalin worked). He is the author of more than 100 works and books on questions of planning, forecasting, and the theory of scientific and technical progress. At present he is RF [Russian Federation] First Deputy Minister of Science and Technical Policy.

Fedorovich: Andrey Georgiyevich, what is the Ministry of Science and Technical Policy for you personally? Is the new name of the former State Committee for Science and Technology merely the copying of some western models or is an entirely specific meaning incorporated in this?

Fonotov: Well, in general the existence of such a ministry is not entirely typical of the West, although it does exist in England, France, and the FRG, but not, for example, in the United States. Following Russian traditions, any socially significant function is not realized until it has been institutionalized. Any public movement or organization, for example, a ministry, can be an institution. Many of our best minds, among them Karamzin, Solovyev, and Klyuchevskiy, back in the 19th century noted that in Russia progress always came from above. P.N. Milyukov asserted that the government in our country was more progressive than the people for certain reasons, history points to this, the facts testify to this. So today the ministry of science, if we talk about its specific tasks, is called upon to create a new environment, in which the scientific community should function. People often call me an institutionalist, but, believe me, my conviction is based on rather specific things. In the future the main goal is not only to support scientific directions, to plan priorities, as is done at times, or to chose the directions that are most important from the standpoint of the national economy, although all this is an indispensable condition of the activity of the ministry. The primary thing under present conditions is to create a new institutional environment. And the future of Russian science actually depends on how successfully we accomplish this task.

Fedorovich: Does technical policy today consist precisely in this?

Fonotov: Yes, because under stable conditions, when normal institutions, which determine the functioning of one sphere or activity or another, have already been established, all the above-named problems are solved as if automatically in the process of the routine activity of the corresponding institutions.

Fedorovich: Well, we are starting from scratch....

Fonotov: If you consider that a few years ago market institutions were included on the list of mortal sins, we need the ministry. But this is, so to speak, one aspect. But the other aspect is that we always had a kind of idea, which was given by Marx, about the laws of socioeconomic development. There were so-called formations, there were modes of production, they replaced each other in succession, while the Bolsheviks were distinguished from all the others by the fact that they were the first to realize in what kind of system they were living and determined the levers, which it is possible to actuate in order to speed up in the interests of mankind the replacement of some formations with others. In reality this, as in science in general, is merely one of the possible hypotheses of the development of society, moreover, as experience shows, a very approximate hypothesis. There can be many such hypotheses. Therefore, it is strange when people say that Marxist science is the only true science....

Fedorovich: And it is omnipotent, because it is true....

Fonotov: Precisely. For some people it is. But for some people it is false. Such a Marxist love triangle with science at the base. But if we speak seriously, the approach based on types of development seems more adequate to me. I have attempted to formulate a certain hypothesis—I need to do some more work on it in order for it to be confirmed—which states, in particular, that somewhere at the turn between the 17th and 18th centuries mankind passed from stagnant, random development to the innovation, or evolutionary, type. How does society today differ from what we had several centuries ago? We consciously cultivate innovations. Vernadskiy has an excellent illustration of this: All the basic achievements of mankind—the wheel, fire, the compass, paper—do not have authorship, because they were developed by people, who did not find themselves in the course of civilization and were somewhere on the periphery of human development. At that time completely different forces and different people were the motive forces of civilization. But today we ourselves are artificial, and our problems are problems, to which man himself has given rise. And in order to survive somehow in this system, we should cultivate what is new all the time. It is no secret that the basic institutions of modern society were introduced to Russian soil from outside. I defined such a type of development—survival at any price—as the mobilization type. Precisely for this reason the planting of market relations for us is not simply the problem of, say, developing the same institutions: All the same the mobilization and innovation types of development differ completely. A mobilization economy, in

particular, cannot even be called an economy, since in it the criterion of efficiency or economy is completely absent. Only the enormous expending of inefficient labor takes place. The best means of getting rid of the defects and drawbacks of the mobilization type is the switch to the innovation type of development. For this it is necessary to reform fundamentally all the spheres of our society and to change in principle its reproduction mechanisms.

Fedorovich: Andrey Georgiyevich, let us all the same return to science and to what is now happening in it. We received, honestly speaking, a difficult legacy. It turned out historically that industry, which in our country had always nudged science, had been militarized. The scientific traditions in our country are a very graphic illustration of this. We have, perhaps, so few scientists who are Nobel Prize winners because our science was basically a "closed theme." How are you trying to change this?

Fonotov: No sphere on this level can be changed individually. Science is a part of the overall cultural system of society, if you take our Soviet culture, it was completely deficient. And this appears first of all in the quality of scientific personnel.

Fedorovich: But were there outstanding scientists in the USSR?

Fonotov: As is known, the blossoming of Russian science of the end of the 19th century and the beginning of the 20th century was accompanied by the overall cultural blossoming of Russia of that time. And this confirms my ideas that Soviet science was in some sense the illegitimate child of Russian science. Because many domestic scientific schools and prominent scientists were educated in tsarist Russia—take Zhukovskiy, Sikorskiy, Zvorykin, Ipatyev.... And the next generation still stayed at the level which Vernadskiy, Pavlov, and Florenskiy predetermined. But then that was all, it was a waste. You get Chernobyl, you get accidents on gas pipelines, capsizing ships, falling planes. In our country all values, which determine the ethos of the scientific community, were turned upside down, the result is that the ethos began in the final analysis simply to be destroyed. Only people like L.V. Kantorovich, who lived outside this community and was an unworldly man, were able to survive. Such people were able to aspire to Nobel Prizes. Science has its own laws of development, and it is impossible to judge it in terms of benefit or harm. This is a very intricate institution, which the most complex and most subtle combination of conditions of origination precedes. We today, unfortunately, do not have an environment, in which science could have a full-fledged existence. For long years the state decided what it was necessary to do, in what directions, what directions were beneficial and what ones were harmful. We shut down cybernetics and genetics and launched scientific communism. Scientists were employees. The priorities of science were distorted: First of all they directed attention to technical disciplines connected with the production of weapons. For example, the theory of Pavlov was cultivated because it made it possible to influence the state of the mind and social psychology. Our not so stupid disciples of Stalinist, communist, and similar propaganda used splendidly the theory of conditioned reflexes. If about 10 years ago you were to say to a person the word imperialism, he would issue the corresponding discordant epithets. Things, which did not particularly interest the state, were neglected. Modern directions of knowledge and research could not actually and intrinsically ripen on Russian soil, by imitating we were all the time in the position of chasers. Our present situation first of all is dictated, unfortunately, by the loss of the internal mechanism of the self-development of the scientific community. Of course, in all countries of the world science is to some extent both a maidservant and a kept woman of the state. But all the same there are limits, beyond which the actions of the state begin to affect science destructively.

Fedorovich: In the West, as is known, the state plus some companies or others sustain academic and university science. Mainly firms support sectorial science. In our country they are tearing the state to pieces: Money is needed here, money is needed there, but there is no money, so will we imitate the western system or will we invent our own wheel?

Fonotov: You and I talked about Soviet science. However things were there, this science functioned and achieved some goals, otherwise they simply would not have supported it. But the point is that when certain social institutions fade away and recede gradually into the past, science, which was formed as an integral part of this society, of course, also cannot be preserved in the form in which it existed. However, a question arises: What kind of science can form in our country, if we do not know toward what kind of society we are heading? The very general parameters, which are formed in programs of the state and in other public documents, thus far are incapable of tracing this society clearly. One thing is clear: This should be science that is based on the free search for the truth. Of course, it is possible to reply: How can a scientist be free, when they do not give him money? I understand, for today's people of science this is a drama, but they are now if only not forcing them to report back at the meeting of the party committee on the work that has been done. And they are not making them go during working time to ideological seminars. Nevertheless we have been forced to find answers to many questions: After the structure of the government of the country was changed, many scientific research organizations found themselves thrown to the mercy of fate. And thereby the stream of assets, which came to them through certain channels, dried up. What was it necessary to do immediately under these conditions? The idea of federal science centers arose. Of course, for the present it is rough, moreover, thus far they have been creating obstacles for us, and we simply cannot get our legislative acts through the staff of the government and through the numerous reconciling instances. For

example, they say to us: "Why does the science center contain several legal persons? Let them unite into one." But would you try to make such institutes as the Central Aerohydrodynamics Institute, the Scientific Research Institute of Aviation Technology, and the All-Russian Scientific Research Institute of Aviation Materials one legal person? Each one has its own very well-known trademark. We argue, ask advice, and seek allies. Meanwhile, you know, in the year and a half that I have been in this chair, the nature of the interrelations in the scientific community has changed appreciably: Earlier people came to us, figuratively speaking, on half-bent legs, but now they drop in like they would at a scientific seminar. We and they talk, argue, and swear at one another. Of course, the Ministry of Finance ruined us soundly, when it ceased to pay us money in May, and we, for example, during the third quarter received only 13 percent of the amount of planned assets. One has to extricate oneself by means of reserves, owing to the fact that organizations are getting credits, thereby running into big debts. Some of them will probably not endure such a thing. But nevertheless I am observing a completely different nature of interrelations—not supplication, but partnership.

Fedorovich: But scientists are continuing to leave. What is your attitude toward those who are leaving Russia?

Fonotov: A combined attitude. In any society there can be a situation, when people simply have not been able to adapt to the existing circumstances in the collectives in which they work. There are no complaints here. A person did not find himself here, perhaps, he will find himself there. It is no secret that today we are also continuing to finance not scientists and not scientific schools, but abstract "collectives." In our country the addressness is for the present still weak, that is, the elite, the people who are most talented, thus far can directly receive money in our country with great difficulty. Nevertheless many people are leaving not because abroad it is possible to eat and dress well and educate children, but because here they have no opportunity to work. And nevertheless, no matter what difficult times there are today, I want to say that there is the concept of a common cause and one's native country, which today is having a hard time and which it is necessary to help. Although Guy de Maupassant called patriotism the egg that war laid.... I believe that in bad times it is necessary to assume the general burden of problems, while it is necessary to leave in good times, but this, unfortunately, is in theory.

Fedorovich: And how many scientists have we lost today?

Fonotov: Now about 90,000 are leaving annually. Incidentally, this figure comes to only a fourth of the quantity of so-called permanent emigration from the USSR. In practice of these 90,000 only 2 percent fall to the category of scientific workers. True, one should specify: This figure is from the department of visas, the OVIR. But there are, after all, also those people who, while leaving for a temporary job, remain abroad forever. The statistics are silent with respect to them. The scale of this process is rather large. At the Academy of Sciences there are already now institutes, at which half of the lead associates are on missions abroad.

Fedorovich: If we have begun to talk about the Academy of Sciences.... What do you think of the latest edicts that give the highest echelon of science, that is, academicians, all sorts of benefits?

Fonotov: All edicts are not alike. And, of course, any edict, which is aimed at supporting science, the scientific community, and the scientific and technical potential, should be regarded as positive. But I am categorically opposed to it when one of the units of the scientific community at the expense of others carves out certain benefits for itself. In our country many people believe that the academy is all Russian science, although the academy is only 8 percent of the people and 12 percent of the scientific potential. In our country basic research to a significant extent is conducted outside the academy. For example, high energy physics, chemistry, and economics. The academy is very respected and prestigeous, but nevertheless one of the institutions of the scientific community. Therefore, when the president signs an edict, which for some reason is entitled "On the Material Support of Russian Scientists," and puts all these assets into the hands of the Academy of Sciences, the entire scientific community is bewildered. I do not believe that one must not give anything to the academy, but it is necessary to give something to the Ministry of Science and Technical Policy, because we formally represent the entire scientific community. In reality we represent for the scientific community the state and for the state, the scientific community. So that an independent committee, of which it would not be a sin to invite foreign scientists to be members, should probably be established for such actions. A comprehensive approach to the very functioning of science and a unified position of the scientific community are necessary, otherwise many good initiatives will be doomed to failure. For example, all our attempts last year to get through the Supreme Soviet a draft law concerning the fact that grants would be exempt from any tax assessment, were torpedoed. They said to us: If foreign charitable foundations give such aid, we will not tax it, but if a university—this is as is not a charitable organization—gives it, please, we will take it without fail. Today we are thereby consciously cutting off the narrow stream of money, which Russian science is capable of receiving from abroad. If the actions of the scientific community in such cases were coordinated, the results would be more significant. And some parts of the scientific community must not try to gain some advantages at the expense of the others.

Fedorovich: What do you think of the fact that several scientists have begun to open their own firms? Fedorov is a hackneyed example, but there are also others....

Fonotov: There is nothing bad in this. Incidentally, many of these firms in one way or another are financed by the Ministry of Science and Technical Policy. We financed Fedorov, for example, very solidly, considering the

social value of what he does. The state under Ryzhkov gave him about 300 million rubles. At that time this was an enormous amount of money. And today it is a considerable amount: somewhere around 300 billion rubles. We hope that many of our scientific production associations, which have a good research potential, for example, the State Optics Institute imeni Vavilov and the State Institute of Applied Chemistry in St. Petersburg, in a few years with better, normal guardianship of the state, and first of all the Ministry of Science and Technical Policy, will become Russian du Ponts and Fords. The State Institute of Applied Chemistry, in particular, has a unique technology of ozone-safe coolants. Both the Koreans and du Pont have already offered to buy them from us. In pharmacology there are quite amazing developments. In practically all spheres we have world-class developments, and we should learn to commercialize them.

Fedorovich: And what is happening now with the scientific and technical centers that we built abroad?

Fonotov: Do you have in mind distant foreign countries or neighboring ones? In the former USSR many research facilities remain, including in Tajikistan, Uzbekistan, and Ukraine. We also did much building in developing countries, incidentally, we also have something in developed countries. Inasmuch as during the construction they used our standards and our technologies, they were thereby bound to our markets. And we, of course, should make every effort so that Russian metallurgists, not specialists from the FRG or Japan, would carry out the reconstruction of Bhilai. We have all the resources for this. It is necessary to agree to the elimination of any political problems that arise, for the best policy is a good economy. Of course, because of security considerations it is impossible to release some technologies from control, selling them thoughtlessly to third countries. Here together with interested departments we are trying to establish some barriers. As to neighboring foreign countries, the trends of cooperation in the CIS are intensifying, a commission, which, it is true, for the present is poorly picking up speed—the interstate scientific and technical council—has been established; there are agreements that regulate the use of joint facilities, for example, in Uzbekistan, Kazakhstan is next in line, and, I think, we will come to an agreement with Ukraine. Honestly speaking, without our former republics, particularly Belarus and Ukraine, it will be very hard for us to live: We will have to create everything from scratch. I am not talking at all about space research. In order to build a new Baykonur, we need to put the entire country on a starvation diet....

Fedorovich: Are there weaknesses in your activity as deputy minister? Do you sympathize, perhaps, with some specific area of science?

Fonotov: I have a weakness for talented people. Inasmuch as the scientific elite of the country passes through this office, it is necessary to work with it, it is necessary to help them, it is necessary to lead them to the machinery of government and to admission to other ministries. As a whole first of all the problem of scientific and technical policy, for the formulation of which I am responsible in the ministry: How, what, by what forces and in what time we will do all this, is important for me.

Fedorovich: So how much time, in your opinion, will we need in order to restore the scientific potential and not to end up in the category of third-rate countries?

Fonotov: There is an optimistic forecast and a pessimistic forecast. The pessimistic forecast is 30 years. While the optimistic forecast depends on a large number of subjective factors. If the president had been able to reach an agreement with parliament in December of last year, we would be today much farther along the path of reforms and would have already now some results. And there would be no talk about the fact that atomic reactors are standing unattended somewhere in Dmitrovgrad or in Obninsk and soon there will be no one at all to work at them, because there is nothing with which to pay wages. Poorly financed science, as we understand, increases significantly the risk of a catastrophe. True, the fact that people are continuing to work even under these very difficult conditions, is consoling. And therefore I am not losing hope: Given favorable circumstances in about 10 years we will all the same have overcome what we dread most.

Yeltsin Decree on Financial Support for Russian Scientists

947A0010A Moscow SOBRANIYE AKTOV PREZIDENTA I PRAVITELSTVA ROSSIYSKOY FEDERATSII in Russian No 38, 20 Sep 93 pp 3830-3831, Article 3516

[Ukase No 1372 of B. Yeltsin, president of the Russian Federation, Moscow, the Kremlin, On Measures for Financial Support of Russian Scientists, 16 Sep 93]

[Text] In order to preserve the intellectual potential of the Russian Federation, further develop basic and applied research, and to intensify State support of employees in budgeted scientific organizations and higher educational institutions of Russia, it is hereby decreed:

1. To establish as of 1 January 1994 five thousand monthly State research grants in the sum of 1,000 rubles for outstanding Russian scientists, and one thousand monthly State research grants in the sum of 50,000 rubles for talented young scientists, which are to be awarded for terms of up to 3 years by decision of the Russian Academy of Sciences, with consideration of suggestions of higher educational and research institutions of the Russian Federation.

   The Council of Ministers—Russian Federation Government is to approve within one month a Statute on procedure for awarding the said State research grants to be submitted by the Russian Academy of Sciences.

2. The Council of Ministers—Russian Federation Government will:

   a) establish as of 1 November 1993:

      —salaries in the sum of 150,000 rubles for members of the Russian Academy of Sciences with the scientific title of academician, and in the sum of 75,000 rubles for those with the scientific title of corresponding member;

      —supplemental monthly payments equaling 50 percent of their regular salaries for associates in budgeted scientific organizations and higher educational institutions holding academic degrees of doctor of sciences and candidate of sciences.

   b) examine within one month the question of raising as of 1 January 1994 the salaries for scientific title of members of the Russian Academy of Medicine, Russian Academy of Agricultural Sciences and Russian Academy of Education;

   c) submit, following established procedure, to the Russian Federation Supreme Soviet proposals on additional allocation of funds in defining the indexes in the Russian Federation republic budget for 1993, as well as provide for allocation of funds for implementation of measures stipulated in this Ukase when drafting the 1994 Russian Federation republic budget.

3. This Ukase is effective as of the day of its publication.

Russian Banks Reluctant to Finance R&D Efforts

947A0014A Moscow IZVESTIYA in Russian
11 Nov 93 p 4

[Article by Irina Demchenko, IZVESTIYA correspondent: "Banks Do Not Want to Finance 'Pure' Science"; the first paragraph is an introduction]

[Text] An attempt to analyze what sums are being invested in the development of science and development and introduction of new equipment and technologies has been undertaken by the Market Conditions Center of the Russian government. A total of 1,500 directors of enterprises with different forms of ownership, representing 11 industrial branches, answered questionnaire items related to innovation activity (work director—Georgiy Ostapkovich).

The inquiry indicated that so-called branch science, the scientific research institutes and design bureaus specializing in the filling of orders of enterprises in definite industrial branches, has almost completely lost orders directly from enterprises and exists only under conditions of a constant shrinking of budgeted financing. Virtually all the work on improvement in the technology of production and the quality of products has been shifted directly to the enterprises and less than half the queried enterprises are at all concerned with this.

The principal direction in innovative activity at enterprises is the introduction of new types of production (about half the queried directors). Work on the automation of production, the introduction of new technologies and forms of organization of activity were mentioned by three or four times fewer directors. In the administrative sphere renovation most often involves computerization (39%).

In the future a quarter of the queried directors intend to invest sums on innovations. Joint stock companies are exhibiting great activity in this field and the least activity is being displayed by leasing enterprises, partnerships with limited responsibility and production cooperatives. As the principal sources of financing the directors mention their own resources, as well as short- and long-term loans.

The directors of 173 commercial banks also participated in the inquiry. More than half of them declared that they make no loans at all for innovation projects, despite the fact that the income received by the banks as a result of such loans is free of taxation; 48% of the queried banks grant loans for innovative projects directly to industrial enterprises and the more actively the greater the statutory reserves of the bank.

The bankers, in answering the questions on the questionnaire, declared bluntly that financing for the renovation of production facilities and production will be made available only after a system for state insuring of credits for innovations has been established and a clearly defined mechanism for the application of a secure loan law has been introduced.

In commenting on the situation in this field, Garegin Tosunyan, president of the Moscow Bank for the Development of Science and Technologies (Tekhnobank), stated that hopes for the financing of science in the absence of patent and juridical protection of the results of individual work, as well as management servicing scientific circles, is an illusion from which it is necessary to escape as soon as possible. In his words, specialists developing innovations most frequently turn to the bank themselves asking for sums either for a particular project or on a handshake: we will buy something, sell it, repay the loan, and pay ourselves from the profit. Virtually not once, said the banker, have we dealt with an engineer, scientist or designer who was capable of looking at the extension of credit problem from our point of view: how great are the chances that the sums handed out by the bank today will be returned tomorrow with a profit compensating for all the losses, including inflation? To the question of specialists of the Tekhnobank credit section from whence the various kinds of equipment necessary for the new production would come, the most common answer is: "They promise they will supply us with it."

It is interesting that there is at least one sphere of production in which the banks themselves have recently begun to exhibit innovative activity: the production of

pharmaceuticals. This market at present to a considerable degree is not filled and the demand is very high and elastic: there are medicines for which people are ready to give their last ruble. In addition there are idle plants at which it is possible to master the production of new drugs and an alternative marketing network. In this field itself a management system is now being formed serving the interests of developers and bankers and a system for search for new drugs for the purpose of financing their production.

With respect to the remaining branches, according to data from the Market Conditions Center, the greatest innovative activity is observed in ferrous and nonferrous metallurgy. The situation with innovations in the light, food and printing industries is the very poorest.

Yeltsin Decree Fails To Resolve S&T Finance Problems

947A0018A Moscow NEZAVISIMAYA GAZETA in Russian 30 Oct 93 p 1

[Article by Andrey Vaganov under the rubric "Upside Down": "The Present Generation of Russian Scientists Will Live Under Communism. At Least 700 People Are Already Living Under It"]

[Text] Last Monday more than 700 associates of the Joint Institute of Earth Physics (OIFZ) of the RAS [Russian Academy of Sciences] voluntarily (!) took two-week leaves without the retention of pay.

"The most skilled personnel: deputy directors, heads of laboratories, lead scientific associates, heads of economic subdivisions—in all 81 people—voluntarily refused to receive wages," relates Academician Vladimir Strakhov, director of the OIFZ. "In their statements they wrote as follows: I wish the days to be considered workdays, but wages not to be credited."

Another 684 associates of the OIFZ—again voluntarily—took leaves without pay proper. But of them very many are continuing to come to the institute and to perform their official duties.

"The sense of responsibility of the scientist proved to be higher than considerations of an accounting nature. And I am very grateful to them for this," Vladimir Strakhov emphasized. "This action is enabling us to release 40 percent of the month's wage fund, that is, 23 million rubles [R]." In all at the institute it had been planned to spend a little more than R80 million on the September wages. R62 million were allocated from the state budget. But this money so far has also not come to the accounts of the OIFZ.

What the Bolsheviks talked about for so long—"we will arrive at the victory of communist labor"—has come to pass: About 70 percent of the associates of the academic institute have already arrived at this ideal. And voluntarily besides.

Incidentally, this occurred on the eve of another significant and long-awaited date for Russian science. "For the purposes of the preservation of the intellectual potential of the Russian Federation, the further development of basic and applied research, and the increase of state support of the workers of budget-carried organizations of science and higher educational institutions of Russia I decree...." I have quoted the preamble of Edict No. 1372 of the president of the Russian Federation of 16 September 1993, "On Measures on the Material Support of Scientists of Russia." Several points of this edict should take effect on 1 November of this year. (The salaries for the academic title of academician of the RAS are R150,000 and for a corresponding member, R75,000; for scientists of budget-carried organizations and workers of higher educational institutions the monthly supplementary payments for academic degrees are 50 percent of their official salaries.)

According to the information at the disposal of NEZAVISIMAYA GAZETA, neither in the planning and finance administration of the RAS nor in the departments of the RAS does anyone know precisely the technology of implementing this point. Although "instructions" have arrived at several scientific organizations: If the financial situation permits, you are allowed to fulfill this edict.

The road to hell, as is known, is paved with good intentions. And this hell has quite real, specific financial parameters. As a whole for the section "Science" for nine months of 1993 financing was opened in the amount of R500,380,049,100. What is this? This is 49.3 percent of the annual plan and 75.7 percent of the plan of nine months. The total arrears of the budget to science are R160,672,337,900. The institutions of the RAS and its regional departments have been financed at the level of 86-100 percent. The financing of priority directions of science and technology is 70.6 percent of the plan of nine months and 46.5 percent of the annual plan.

The financing is broken down by specific directions in the following manner. Programs of operations of state science centers—82.6 percent of the plan of nine months; state scientific and technical programs—60.6 percent; the most important national economic programs and projects—62.8 percent; international programs and projects—40.8 percent; regional centers and programs—24.5 percent, programs of the development of the innovation infrastructure of science—7.5 percent; financing of the Basic Research Fund—58.6 percent.

There is another detail. According to the testimony of a high-ranking administrative worker of the RAS, in recent times talk, the goal of which is to prepare the ground, and at the same time the Russian Academy of Sciences itself for the decrease of its budget next year, has been circulating in the Russian Federation Ministry of Finance.

Fortov Reorganizes Basic Research Fund, Seeks Impartiality

947A0021A Moscow DELOVOY MIR in Russian 4 Dec 93 p 5

[Article by Vladimir Pokrovskiy, under the rubric "Science": "Expertise Becomes Independent"; first paragraph is DELOVOY MIR introduction]

[Text] The council of the Russian Basic Research Fund [RFFI] has approved several documents that regulate virtually all actions of its staff and experts, which will make it possible to settle any conflict situations and, as a result, to enhance the effectiveness of RFFI.

In essence, the regulatory documents amount primarily to clear-cut delegation of functions and authority of fund agencies: fund council, expert councils, executive committee, body of experts, and fund management. At present, the procedure of providing expert opinions is as follows. Applications for funding come to the expert council and two experts (let us recall that in the 1993 competition, because of the shortage of personnel we had to limit ourselves to one expert per application), whose names are kept secret. Each expert qualifies a project on the basis of several aspects and gives it an overall rating, using a three-point scale: "definitely supported" (1), "can be supported" (0), and "rejected" (-1). If all three ratings are positive, the project automatically receives support.

Each scientific direction (according to the quota approved by the fund council) has the right to a specific share of the RFFI budget. If, after supporting definitely approved projects, it is not exhausted, projects with one zero and two one's come next, and so on in descending order. If there are insufficient funds to support the next batch of applications, they are submitted for consideration by the expert council. Within the quota limits, approval of applications is purely automatic.

There has also been a change in structure of the RFFI: there is approval of the composition of the executive committee, which assumes some of the duties of the fund council during the period between its meetings. There has also been approval of expert councils and composition of the body of experts. Experts are allowed to submit applications for grants to the RFFI on a general basis. In the opinion of fund staff, the rules that have just been adopted are theoretically quite capable of resolving any conflicts that may arise.

The slogan proposed by its new chairman, Academician Vladimir Fortov, is "Independent expertise with high intellectual potential."

In our opinion, everything will depend on how well the new rules we have described will work. And we are assured that they must work well because activities of the fund will be automatic, instead of being subject to influence peddling or the will of superiors. It seems that the fund's affairs are on the rise. Incidentally, it receives funds directly from the Ministry of Finance, rather than through the Ministry of Science, as before. With today's shortage of money in Russia, the fund receives almost everything it is supposed to (as does all of science, about 80 percent): this year, the fund expects to get 24 out of the 30 billion rubles requested (it has already received 13.5 billion), and it will use these funds to complete the bulk of its 1993 programs, and first of all the program for individual and group grants.

At the present time, work is in progress on the concept of augmenting the sum in the RFFI account by making expert evaluations of projects having no direct bearing on basic science. Specialists from institutes of the Russian Academy of Sciences, institutions of higher learning and industrial laboratories have been included among the RFFI experts. True, the fund is not being inundated with orders, although it is already obvious that very large entities require such a service, for example, the VPK [military industrial complex]. Negotiations with customs officials have begun concerning expert evaluation of materials transported across the frontier. On this score, Vladimir Fortov stated: "There is not a single organization in the country today that could compete with us in intellectual potential and our independence of other agencies."

Being a nonprofit organization, the RFFI can receive money only from the State budget or in the form of voluntary contributions. I hope that Russian entrepreneurs will hear the latter, and will realize that science is the highest and main potential for the future rebirth of Russia. It is time, finally time to learn that "gray gold" is much more precious than "black gold."

Fonotov Comments on Ministry of Science Funding Policies

947A0021B Moscow ROSSIYSKIYE VESTI in Russian 24 Nov 93 p i

[Interview with Andrey Fonotov, doctor of economic sciences, Russian Federation first deputy minister of science and technological policy on "The 'Three Whales' of Technological Progress" by Yevgeniy Temchin; first paragraph is ROSSIYSKIYE VESTI introduction]

[Text] Andrey FONOTOV, RF first deputy minister of science and technological policy ponders on problems of funding basic and applied sciences.

Question: Andrey Georgiyevich, the situation in Russian science is common knowledge; Russia has already lost many great minds, and there will be more losses. Does the ministry have any plan or idea to save at least what is left?

Answer: There is an idea and we are trying to implement it as much as possible. While funding of research was virtually unselective under the former socialist State, at present we are striving to adopt expressly this attitude, which is foreign to our science.

The market has shown how much people are worth. Those who were failures before do not shine now either. Whereas active, talented scientists are not needy today. They have the opportunity to earn well, serve as consultants for projects and programs, providing their exert opinions.

The State is unable to support economically all scientific groups. Not a single state, even the richest one, can afford such luxury. A strictly selective approach is used in the United States, Germany, Japan and other countries. The State funds one project and freezes another, since it believes that there are more pressing problems at a given time. It is expressly this direction that our ministry is trying to follow.

In short, there are three directions in our idea. The first is to give economic assistance to implement major pioneering projects and research programs that could raise our science to the worldwide level. The second is to support selectively the strongest and most promising research organizations. The third is to provide financial assistance to outstanding scientists deserving of worldwide recognition, as well as to the most gifted representatives of the young generation. The RAN [Russian Academy of Sciences] has already won a decision, according to which the State pays high-class scientists something like an increased grant. Of course, the money is not commensurate with the research results, but still it is rather substantial assistance.

Question: But this applies to basic science, what is to be done about applied science?

Answer: Applied science should be funded on the basis of return. If the project is promising, the State must fund it, but not as was done before.

Question: Please explain.

Answer: In giving funds to support some laboratory or some institute, the State is giving, so to speak, an advance. When a buyer pays for a completed project, a specific part of the proceeds, let us say thirty percent, must be returned to the State.

Question: Is this something like a bank credit?

Answer: Yes, but on preferential terms, without payment of high interest. At the present time, our ministry is trying to involve commercial banks in this matter. In simple form, the idea consists of the following: A commercial bank investing in the support of innovative projects offers considerable preferential terms to creditors and, in turn, enjoys certain benefits from the State. It should gain from supporting innovative work.

Question: In Russia, State research centers (GNT) are formed at the initiative of the ministry. As a rule, these are known research institutes that enjoy worldwide recognition. However, some specialized research institutes involved in applied science are also included. And this is wise: industry cannot live without applied science. How many GNT are there in Russia?

Answer: At present there are thirty-six.

Question: But there are hundreds of specialized research institutes. It appears that most of them are either doomed to fail or compelled to look for work on the side, rather than in their own field. Plants do not have resources at the present time for high-grade technologies and related research. I think this is a very dangerous situation for industry.

Answer: Of course, we are striving to support specialized science, which is carrying out highly effective and promising work. But first the authors of such work must submit to us technical and economic validation, results of marketing studies and a business plan. Then this work is submitted to expert evaluation and, if it has merit, it receives budgeted funding. But this applies to pioneer projects that hold great promise. And if a new processor is developed, it is a strictly commercial development and its authors should look for buyers themselves.

Question: Who evaluates the technical and scientific level of a new development?

Answer: There is the Russian Institute of Scientific Expertise. It has a data bank with information about outstanding scientists, and they are called upon to do this work. The names of the scientists are kept secret, even we do not know them. The opinion of experts about a specific project is given in the form of a recommendation. The final decision is made by the ministry. Then, if the project is approved, we turn to the Government, prove its timeliness and obtain funding. Under present conditions of the Treasury, this is not a simple matter.

As for GNT, and the list will grow, we believe that they should enjoy not only preferential credit, but also preferential rates for fuel and electricity. I wish to stress that the GNTs status is not given permanently, but for only three years. If the project does not yield the promised effect in this time, the State stops funding it.

Question: Do the experts have some responsibility for the results of their work?

Answer: Yes, unquestionably. This is stipulated in pertinent documents. But I wish to make a comment. Let us assume that our developers created an excellent computer and the experts noted its high qualities. But who is going to buy it when the Japanese sell the same one for one-third of our price? Or, for example, the problem with sugar. People come to us and offer a new technology for producing sugar from starch, and this would solve the shortage problem. But, how much will the end product cost? We find out that it is much cheaper to purchase sugar abroad than to use this technology to produce it. What sense is there in funding such a project?

Today there is no problem with the technical execution of some specific task. There is another problem, that of its cost. Is it economically expedient? Scientific technological progress occurs at the intersection of technology and economics. The ministry is approaching problems of funding science from expressly these positions.

Statistics on Emigration of Russian Scientists

947A0011A Moscow NEZAVISIMAYA GAZETA in Russian 26 Oct 93 p 12

[Article by Natalya Morgenshtern: "All This Brain Drain. The West Can Find Jobs for 200,000 Russian Scientists. If Russia Cannot Do It"]

[Text] The general mood in many Russian research institutes can probably be characterized as a state of quiet panic. Salaries are held back for months, and the rate is close to the "zero variant"; the arrival of scientific literature has virtually stopped, there may also be no light or telephone. Every time there is news about the departure of a colleague to work abroad on "outrageous" terms, according to our and the Brazilian concept, those left behind fall into even deeper despondency.

What is really happening? A recently published study, "Emigration of Scientists From Russia: Today and Tomorrow," by O. A. Ikonnikov (Moscow, 1993, 123 pages, illustrated) strives to answer this question. The study was carried out by order of the Russian Federation Ministry of Science and contains abundant analytical and statistical data on the brain drain problem, and its impact on the Russian scientific potential.

We learn that the level of emigration from Russia is not high as yet, even by West European standards. The main form of brain drain is religious-ethnic migration (Germans to Germany, Jews to Israel); nor have so many left for contractual work or to study, according to the fragmentary official data. Thus far, 8.1 percent of all individuals who go to Israel (6.0 percent to the United States, 8.3 to Germany) are scientists and public educators.

Perhaps there is nothing to worry about? Nevertheless, there are obvious grounds to take emergency steps on the highest level. What is frightening in today's brain drain from Russia is that it is occurring against a background of mass change from research activities to entrepreneurial, managerial, political activities, loss of job or qualifications. The process will inevitably progress with reduction of State funding of science and obvious difficulties in balancing goals and funds in scientific policy, from the standpoint of priorities. Thus, in 1991, 522,000 people left the field of science and scientific services. But departure abroad of citizens working in this field did not exceed 5,300 people.

Table 1. Emigration of RF Citizens With Higher Education From Moscow to Different Countries in the First Quarter of 1992

Country	Percentage
Israel	42.0
United States	41.0
FRG	8.0
Australia	4.0
Eastern Europe	1.4
Canada	0.8
Great Britain	0.6
Other countries	2.0

Table 2. Occupational Structure of Emigres From Russia in 1992

Field	Percentage
Industry	27
Agriculture	15
Trade	8
Science	8
Health Care	7
Cultural	2
Other	33

The hypermobility criterion proposed by the same author (see O. A. Ikonnikov, "Hypermobility of Scientific Personnel: Problems of Forecasting," 1993, No 3, pp 96-107), i.e., excessive movement of scientific personnel when the scientific-technical potential is devastated, confirms the alarm of our scientists and engineers. Is there a chance that decisions adequate to the acuteness of the situation will be made? Alas, only time will tell.

Science Institutions Continue To Lose Young Researchers

947A0019A Moscow POISK in Russian
29 Oct-4 Nov 93 p 14

[Article by Candidates of Economic Sciences Olga Savelyeva and Irina Pomortseva, the ISTINA Center of Informatization, Social and Technological Research, and Philosophy of Science Analysis: "Where Is the Youth of Science Going?"—first paragraph is POISK introduction]

[Text] We offer to the attention of the readers the next report prepared by the Istina Center, with which we are working in regular contact. Using these and other results of joint work, we intend in the immediate future to broaden the themes and to increase the effectiveness of the installments of "Our Exchange."

In recent years the steady tendency for associates to leave scientific research organizations (NTOs) has emerged. Young people, maintenance personnel, scientific workers of high skills, and middle-level specialists are leaving. Official statistics do not make it possible to establish promptly the scale, directions, and structure of this phenomenon. The work performed by the Istina Center to the order of the department of social problems of science of the Russian Federation Ministry of Science and Technical Policy will make it possible to clarify the situation. During it 42 scientific and technical organizations of Moscow, St. Petersburg, and Moscow Oblast with a total of about 16,000 workers were examined. Academic, sectorial, and plant science, which both is and is not (four organizations) state property, is represented at them. The number of personnel at the NTO ranged from 60 to 3,600.

The survey was conducted in two stages. At the first stage the overall change of the number of personnel during January-May 1993, the sex, age, position, and skills of the scientists and specialists, who quit during this period, were determined through the personnel departments of the NTOs. At the second stage of the survey in a telephone survey of these workers the directions of the departure of personnel from science (emigration, a change of the type of activity, transfer to the private sector of the economy, and so forth) were ascertained. The data of this survey, which were obtained from more than 400 people, made it possible to gain original statistical material that is making it possible to analyze thoroughly the problem of the migration of scientific personnel on the basis of real factual data, and not various kinds of hypotheses.

It turned out that during the first five months of this year the number of personnel at the surveyed NTOs decreased by 7.2 percent. What does this mean? According to the data of the Russian Federation State Committee for Statistics, the annual decrease of the number of employees at NTOs came in 1990 to 12 percent and in 1991 to 16 percent. So far there are no official data for 1992, but the forecasting figure was specified at the level of 20-30 percent. Our survey confirmed the fact that the trend toward the decrease of the number of employees in science also remains during the current year, 1993, although its pace has become somewhat less.

The results of the analysis of the reasons, for which associates quit NTOs, are interesting. Of those surveyed 86 percent did this at their own request or in connection with being transferred to another job (that is, again at their own request). For Moscow this indicator came to nearly 91 percent. Thus, the departure of personnel from NTOs for the present is not connected with organized reductions. Incidentally, last year, in 1992, when at Russian scientific research institutes and design bureaus two or three reductions of personnel were carried out, they were responsible for only 25 percent of the departure of personnel from science.

The analysis of the problem of who is leaving NTOs provides even more food for thought. For this purpose the personal data of 675 scientists and specialists who had quit were studied. The results were somewhat unexpected. Approximately an identical number of men and women quit. However, if you consider that the share of women in science comes to more than 55 percent, it is possible to conclude that men "are being flushed" from NTOs more intensively. Nearly half of those who quit held earlier the positions of engineers, designers, and so forth, about 30 percent held junior scientific positions from trainee to scientific associate. The number of people who quit after the age of 40 exceeds slightly the number of people who quit not having reached this age. Here, however, it is necessary to take into account that the share of the younger age groups at NTOs at present is small, therefore, a high intensity of the "flushing" of young people from science still lies behind the smaller absolute figure.

Of the 675 people who quit during the first five months of this year 18 went abroad (to live or to work under contract for a period of more than one year). All of them are workers of well-known academic scientific research institutes. Thus, not external, but internal migration, that is, the transfer of scientists to other sectors and spheres of the national economy, is playing a far greater role in the dynamics of scientific personnel.

From the telephone survey of those who had quit it became clear that 85-90 percent of them already had an understanding on a new job. In those cases, when a person left "for nowhere," it was quite difficult for him to find a job (the chance of getting a job came to one in five). Only 40 percent of the respondents again went to work in state structures, 52 percent left for private organizations, cooperatives, and joint-stock companies, 6 percent left for joint ventures, about 0.5 percent left for foreign firms, and a little more than 1 percent engaged in individual labor activity. Among the people who left for state enterprises the share of women, people 40 to 60 years old, and those people, who earlier held the positions of senior scientific associates and higher, is large. Primarily men, people up to the age of 40, as well as people who held junior scientific positions and positions of specialists, are getting jobs at

organizations of the alternative sector of the economy. Seventy five percent of the doctors of sciences and 56 percent of the candidates of sciences, who quit scientific research institutes, also transferred to a job at nonstate organizations. Representatives of the physical mathematical and technical sciences, as well as the people, who engaged earlier in scientific and technical development and services and in introduction, prefer them.

Responding to the question of the type of basic activity of the organization, to which they transferred, 23 percent of the telephone respondents named research and development, 22 percent named scientific and technical services and introduction, 25 percent named the making of a product, 19 percent named intermediary activity, 8 percent named commercial and purchasing activity, and 15 percent named services and consulting. The total of the above-cited percentages does not equal 100, inasmuch as the same respondent could indicate several directions of activity of the organization.

The survey also showed that for the most part women and people over the age of 40 are remaining in science or "near it." Young people up to the age of 30 are leaving mainly for the sphere of intermediary activity. Comparatively many candidates and doctors of sciences, as well as people, who held earlier scientific positions from senior scientific associate and higher, are transferring to organizations of the scientific and technical type.

In order to supplement and at the same time to verify the responses to the preceding question, the respondents were asked to assign their new place of work to one of the sectors of the national economy. Twenty six percent of the respondents named the sector "Science and Scientific Service," 30 percent named "Industry," 18 percent named "Trade, Public Dining, Procurement, and Marketing," 6 percent named "Finance, Credit, and Insurance," and 0.6 percent named "Education."Among young people 19 percent went to work again at NTOs, 21 percent left for industry, 28 percent left for trade, and 9 percent left for the sphere of finance. Among those who had quit 37 percent of the candidates and doctors of sciences, 33 percent of those people who had held scientific positions, and only 11 percent of the engineers, economists, and other representatives of nonscientific specialties, who worked at NTOs, remained in science.

For physicists and mathematicians science, education, and finance proved to be most appealing. Representatives of the technical sciences and chemists transferred mainly to industry. About 25 percent of the economics scholars remained in science, 22 percent of the latter left for trade and 19 percent left for financial organizations. Of the surveyed representatives of the humanities 41 percent began to work again at NTOs, 18 percent left for a teaching job, and 18 percent left for administrative bodies. As a whole the obtained data testified that 55 percent of those who left NTOs had changed drastically the sphere of their activity. This is especially typical of young people.

In what did those who quit NTOs engage at their new place of work? Twenty six percent of the respondents replied that they engaged in research and development, 28 percent—in scientific research services and introduction, 18 percent—in entrepreneurial activity, 22 percent—in administration, and 11 percent—in physical labor. It would be interesting to learn precisely who of the former workers of science began to engage in enterprise? For the most part these are men (there are threefold more of them than women), people up to the age of 30 (33 percent) and from 30 to 40 years old (29 percent). In this group there are practically no scientists and specialists over the age of 40. It also turned out that among the new entrepreneurs there are many people, who had held at NTOs positions that were not connected with research activity, and, however strange this is, scientists who had worked on basic problems. And another somewhat paradoxical result that was obtained during our survey is that mainly those people who are over 50 had begun to engage in physical labor.

It is no secret that one of the basic reasons for the departure of personnel from science is the low level of the remuneration of labor in this sector. About 92 percent of the scientific workers and specialists of NTOs consider their income at their main place of work to be lower than average. At the new place they, it seems, are finding what they sought. Nearly 33 percent of the associates, who left NTOs this year, are satisfied with the present remuneration, 34 percent—"more yes than no," 18 percent—"more no than yes," 8 percent are not satisfied, and 7 percent found it hard to answer this question. Thus, 67 percent of the respondents rated favorably their new wage.

The degree of satisfaction with the content of the new job is also high—for nearly 71 percent of the respondents. The highest level of dissatisfaction is observed among the people who engaged earlier in basic research.

And, finally, the last question that was addressed to the respondents during our survey: "To what degree is your new job connected with the previous one?" The responses are broken down as follows. Ten percent of the respondents replied "It is a direct continuation," 28 percent believe "It is connected," for the remaining 62 percent of the scientists and specialists the previous and present jobs are not connected in any way. Among young people this indicator is even higher—nearly 74 percent. Those people, who engaged earlier in basic research and the humanities, proved to be most devoted to their old jobs.

What tentative conclusions is it possible to draw from the results of the conducted survey? First, the tendency for the number of employees in science to decrease remains. Second, the overwhelming majority of associates of NTOs are quitting because they are finding a more appealing (based mainly on material criteria) place of work, and not due to reductions of personnel, which have been organized "from above."

Another important conclusion is that only 40 percent of the scientists and specialists of NTOs, who quit, go to work at state structures. About 45 percent of the respondents are now working again at NTOs or at organizations that are connected with science and technology. It is very important that the satisfaction with the wage and the nature of the work at the new place is nearly ninefold higher than on the average among workers of the sector "Science and Scientific Service."

Scientists and specialists up to the age of 40, that is, the most promising and able-bodied group, are transferring most actively to other sectors of the national economy and are beginning to engage in new types of labor activity. And this latter fact is, perhaps, the most unpleasant and alarming conclusion among those that were obtained during the conducted survey.

Russian Scientist Discusses Common Global Information Space

947A0007A Moscow NEZAVISIMAYA GAZETA, in Russian 20 Oct 93 p 6

[Article by Vladimir Gurvich; under the title RA Global Information System Is Not a Utopia: Its Design Has Been Developed by International Scientists, under the rubric Perspective]

[Text] The International Academy of Information-Disseminating Technology [MAI] was established in 1991. At the present time it has 80 regional divisions in Russia, the countries of the CIS [Commonwealth of Independent States], Europe and America, where its 1,200 members and corresponding members work. The Academy has set as its principal aim the objective of promoting in every way possible the construction of a society in which each individual may freely use the information resources accumulated by mankind. Right now the International Academy of Information-Disseminating Technology is actively preparing to hold an International Forum on Information-Disseminating Technology. It will take place in the Hall of Columns of the House of Unions from 23 through 26 November.

I was talking to the First Vice-President of the International Academy of Information-Disseminating Technology, a leading scientist in the field of computer technology, Eduard Evreinov. As far back as the 1950's he proposed principles for increasing the output of computer processes that have been widely recognized throughout the world.

The line I am working along is the construction of a system of high-output facilities which use the model of the collective. Its essence resides in the fact that the calculations are not done by one person, but by several. The summation of common efforts increase the power of the operations being performed many fold. The President of our Academy, Ivan Yuzvishin, has advanced the following theory on the basis of these principles: let us build a society consisting of small cells, for example, microregions, and let them interact with one another, and agree on their relationships with one another. That is, the entire society will acquire the structure of a honeycomb. What I am saying can be illustrated by the situation which has developed between Russia and Tatarstan, in which just such an interaction model has been used. When I told the President of Tatarstan, Shaymiyev, that he was acting in the vein of YuzvishinUs model, he had not known this, but he was pleased that the correctness of his policy has been confirmed by science. In this case the issue is not self-isolation, but the fact that each country or sovereign republic itself determines the internal regulations of its life. When, on the other hand, the issue relates to problems whose solution exceeds the capacities of the republic, it delegates a portion of its plenary powers to whomever it wishes.

You are in favor of the creation of a unified global information space. So, your activity should be of the same world-wide character.

The International Academy of Information-Disseminating Technology is now on the threshold of joining UNESCO; the question of our recognition as an independent organization is being considered by the UN. Our centers, in addition to Moscow, are located in Washington, Riga, and Kazan. I think, as far as Washington and Riga go, this is more or less understandable. But why Kazan? We want to use this region as an example, to create a model of an information community, all the more so since, as I have already said, President Shaymiyev is using its principles in his activities. He has been granted, in this connection, an honorary diploma of our Academy.

All that's fine, but I would like to know what the Academy is engaged in specifically, since it has taken on itself such a serious mission.

First we need to talk about our means of existence, since everyone knows how science is financed here. We have taken earning our own money as our principle. In practical terms we have the possibility of developing all kinds of projects, since we bring together scientists and practitioners working along the most diverse lines. Let me cite an example. A scientist who has six discoveries to his credit is a member of the International Academy of Information-Disseminating Technology. There are no other scientists of this level in the world. He invented a system which makes it possible to measure the flow rate of a liquid with a precision exceeding the contemporary level by two orders of magnitude. This permits achieving a substantial reduction in the consumption of energy resources.

We are attracting member organizations to this work. The chairman of a cooperative came to us one day and said: I want to work with you, using the AcademyUs resources, and to return the profits towards its development.

If we accept an organization or group of scientists into the International Academy of Information-Disseminating Technology, and they don't have the resources to do the work, the Academy offers them credit.

Eduard Vladimirovich, the situation relating to information science in the USSR, and now in Russia, has always been complicated; in this field we have seriously lagged behind the advanced countries. What can the Academy do to change the situation?

I must say that the information science situation in Russia can't be looked at apart from the rest of the world. Information has become the main product of society. And it is everywhere; to use it effectively we need unified means of transmitting it. The International Academy of Information-Disseminating Technology has worked out a design for a global computer system. A model that brings together individual users and consumers of information into a single common system lies at its base. I have called it provisionally an information enterprise. But information is a product which does not require people to be near one another while they are using it. That is, this information-distributing enterprise should function both in a single-user mode, and when the need arises, as an all-encompassing global structure. It should encompass the entire world. Of course, such a system cannot be made immediately on a world-wide scale; one can start with fairly small units, such as a single city. However, so far there are not enough resources either in Russia or even in the West to bring all this about.

So that's the system. But, domestic computer technology is also not at an advanced level.

As far as theoretical developments go, there we are not behind. Transputers have been produced in England since the beginning of 1980's. They work on principles that I proposed in the 1960's. Now the capacity of transputers has reached 100 billion operations per second. People are working on transputers here as well, and more improved models are being developed than are produced in the West. We are behind in technology; we don't have plants which are capable of producing the equipment. But we cannot fail to get our manufacturing in order, because a country like Russia cannot get by only with imported machines. And the Academy is ready to provide assistance in the resolution of this problem.

Work on Eurasian Patent Convention Proceeding

947A0015A Moscow SEGODNYA in Russian
11 Nov 93 p 8

[Article by Dmitriy Frolov; "Crisis in Patenting Activity at Hand; But It Seems That There is a Solution"]

[Text] It was never easy going for inventors in the first country of victorious socialism. Already in the years of the developing New Economic Plan the rights to their inventions were actually taken away, patents being replaced by Author's Certificates, which to a full measure only the state could use at its pleasure.

However, the collapse of socialism, marked by the breakup of the union, only increased their concerns. The new patent legislation adopted at that time was inefficacious, and beginning on 1 December 1991 Gospatent SSSR ceased to exist.

The unified patent space was destroyed and the vacuum created in the system for the protection of industrial property, it goes without saying, could not go on for long. It then seemed most logical to establish national patent offices in the forming independent states. However, this logic was dictated primarily by considerations of a political nature. It was clear from the very beginning to the professionals working in the field of patent expertise, however, that neither they nor inventors would come out well with such a shape of things. First of all, what naturally happened was that all the specialists and patent archives were concentrated in Moscow. In the overwhelming majority of the new states there was no one to establish their own patent offices and it was known that the protection documents issued by them could make no pretense at authority.

Second, the disintegration of patenting activity put before inventors a task that was not easy solved: in each former republic of the union the application had to be submitted in the national language and the same applied to correspondence with the expert. It is easy to imagine that all this entails considerable costs, to which corresponding fees also must be added.

Third, foreign applicants found themselves in a completely improbable situation: for protection of their rights over 1/6 the surface of the planet, instead of one patent, they had to finalize 15, as already mentioned, not characterized by a solid reputation.

In this very uncomfortable situation it was Rospatent, perhaps, which felt itself on the surest ground. It was the successor of the corresponding union structure, also inheriting from it both the personnel and archives. This circumstance, as well as the fact that most of the inventive potential is concentrated precisely in Russia, enabled the directors of this office to nourish hopes that it would be able to survive the crisis with minimum losses. In fact everything proved to be considerably worse. Whereas earlier the All-Union Institute of State Patent Expertise had annually received up to 200 thousand applications for inventions alone and among these more than 65% were those of Russian inventors, now the number of applications has fallen to 50 thousand. In Russia patenting activity is now experiencing an unprecedented decline, specialists and experts are threatened with cutbacks and unemployment, and all this is occurring at a time when patent legislation in the country for the first time has possibly approached the level of the best world models.

It cannot be said that the organizers of the patent service have not attempted to get around the stumbling blocks and restore a unified patent space. Already on 27 December 1991 representatives of Armenia, Belorussia, Moldavia, Russia, Tajikistan and the Ukraine signed in

Minsk an interim agreement on the protection of industrial property. This act was then regarded as a step toward the adoption of an Intergovernmental Patent Convention. In order for it to enter into force it was necessary that three of the states signing it meet three conditions: recognize validity in its territory of the norm-setting basis of the agreement, recognize the validity of the earlier issued protective documents of the USSR and send a representative and his deputy to an administrative council. The only state conforming to all this was the Ukraine. However, separatist strivings then seemed more attractive to the others, including Russia.

Fortunately, the idea of intergovernmental cooperation for the protection of industrial property, whose viability has been beautifully demonstrated by the European Patent Office, was not buried even in the territory of the former USSR. In March 1993 in Moscow there was a conference of CIS heads of state at which an agreement was signed on measures for protecting industrial property and the organization of an intergovernmental council. Its first session was held in May and in September the draft of a patent convention was prepared which was called the Eurasian Patent Convention. This document was given high marks by the World Organization of Intellectual Property and it is expected that in late December-early January its finalized variant will be presented for signature by the heads of state. In the opinion of Viktor Blinnikov, chairman of the International Bureau for the Protection of Industrial Property, there are already real chances for restoring a unified patent space within a year. The Eurasian Patent Office will become the second major regional association and already on the eve of its birth it is attracting the interest not only of the former members of the union, but also neighbors, members of the former Council for Mutual Economic Assistance. The interest of China, where, in contrast to Russia, there has been no dropoff of inventive activity, also is of special importance.

In principle any interested country can become a member of this pool and no membership dues are required from it, but the activity of the Eurasian Patent Office will be on a pay-for-itself basis. Although the new structure will become an exclusively international organization—the specialists will even have diplomatic status—its organization will bring more than a little moral and material profit to Russia. The headquarters will be in Moscow, all documentation will be in the Russian language, but for conducting a patent search the services of Rospatent specialists will be drawn upon and its archives will be used. According to Viktor Blinnikov, all these services will be suitably paid for, which possibly will assist Russian patent specialists to survive difficult times, and the appearance of a universal patent will stimulate both national and foreign inventors. It goes without saying, if both of these groups hold out another year and the project is successfully implemented.

Problems of Moldovan Academy of Sciences Discussed

947A0016A Kishinev NEZAVISIMAYA MOLDOVA in Russian 23 Oct 93 pp 1, 2

[Article by President of the Academy of Sciences of Moldova Academician Andrey Mikhaylovich Andriyesh: "How Science Is Living"—first two paragraphs are NEZAVISIMAYA MOLDOVA introduction]

[Text] Tomorrow Andrey Mikhaylovich Andriyesh, a physics scholar, president of the Academy of Sciences of Moldova, an academician, an Honorary Member of the Academy of Sciences of Romania and the Academy of Engineering Sciences of the Russian Federation, and an Honorary Academician of the Academy of Cosmonautics imeni K.E. Tsiolkovskiy, turns 60 years old.

The editorial board of NEZAVISIMAYA MOLDOVA joins in the numerous congratulations that are being addressed to the celebrator.

At present Moldova, like all the former Soviet republics, as well as the countries of Eastern and Central Europe, is going through the difficult, excruciating period of the transition from one socioeconomic state to another, from a totalitarian regime and a centralized economy to a democratic society and a market economy. This period has proved to be very complicated, with a large number of most urgent problems of the most diverse nature, with a sharp production slump and crises not only in the economy, but also in all other spheres of social life.

Now a task of vital importance is to find means of getting out of the present situation, the task of establishing a rule-of-law state with a normally operating economy. All structures of society, including, of course, science, are interested and should take part in its accomplishment.

In the modern dynamic world further progress is altogether inconceivable without science. It should provide answers to all urgent problems and, what is more, should foresee and predict the emergence of new problems and the means of their optimal solution. Our scientists are working in such vitally important areas as economics, ecology, interethnic relations, the restoration of the historical truth of our past, the observance of the principles of social justice, and the raising of the prestige of human values. The same, at any rate no less, attention is also being devoted to other directions of academic science. We see in precisely this the role of scientists of the republic at the present stage of its historical development.

The Academy of Sciences of Moldova at present is the leading scientific center of the republic. About 1,300 associates, including 140 doctors of sciences and 770 candidates of sciences, are now working in its 25 subdivisions.

At the scientific institutions of the Academy research is being conducted on urgent problems of physics and mathematics, engineering, geology and seismology, chemistry, biology, agriculture, geography, medicine,

economics, history, language, literature, ethnography, the culture of Moldova, and so on. Our applied research and development are aimed at the solution of the most urgent problems in the area of ecology, agriculture, and power engineering and at the development of new materials and technologies.

Of the most important developments in recent years, which are of directly practical importance, it is possible to name an advanced technology of the cultivation of alfalfa, flow charts of the obtaining of two or three crops a year from the same area, technologies of the production of various biological preparations for the protection of plants, a whole-milk substitute for the feeding of calves, a technology and equipment for the electrospark machining of metals, a set of equipment for the electric refining of vegetable oils, Plazmoliz equipment and technology, a technology of the production of aromatizers from the waste products of the essential oil industry, multicomponent materials for optoelectronics and microelectronics, a technology of the production of synthetic wollastonite, various preparations for medicine, and much more.

In recent years at the Academy of Sciences of Moldova important steps have been taken to bring science in line with the new tasks facing the republic. A new concept of the development of science was adopted. A detailed analysis of the basic directions of research was made. The organizational structure of the Academy was improved. The Government of the republic approved its new charter. The international ties of the Academy of Sciences of Moldova were expanded substantially.

I want to direct attention to one (among many others) important change in the structure of the activity of the Academy, which, we hope, in the future will have a substantial influence on the functioning of all science of the republic. At the end of last year and the beginning of this year three new departments of sciences—the agrarian, technical, and medical departments—were established at the Academy. They are called upon to fill the gaps, which existed until now, in the degree of coverage by the Academy of those fields of knowledge, which until now had practically no ties with it. As a result the research, which was being conducted at sectorial institutes and higher educational institutions, was not coordinated at the proper level on the scale of the republic, which decreased the significance of the contribution being made by science to the national economy of the republic.

At present the coordination of the directions and themes of science in the republic is one of the main tasks of our science. A few years ago such coordination existed, although it was carried out mainly from the union center and to a significant extent was formal. After the collapse of the Soviet Union this coordination also disappeared, although its need in principle is obvious. Precisely for these reasons we believe that the building up of the Academy with the three indicated departments of sciences is called upon first of all to change the state of affairs in this area and to promote the orientation of our entire scientific potential toward the comprehensive and coordinated solution of the most urgent problems of the republic.

At the present stage of civilization science, as an explorer and builder of the future and as an extremely integrated result of creative activity, cannot develop in isolation. It has become an area of joint activity with common results for all mankind. In other words, science is profoundly international and can develop only in case of constant contacts among the scientists of different countries and only through the constant sharing of ideas, opinions, results, and experience.

Our Academy of Sciences already has considerable experience in international ties. However, until the proclamation of the independence of the republic the ties were confined for the most part just to the former union republics and were in many respects of an episodic nature, with the exception, perhaps, of Ukraine and Belarus, with whose scientists we cooperated more intensively, and this cooperation is continuing. In practice we did not have direct ties not just with capitalist countries, but even with the countries of the former Soviet bloc. While the few ones that were maintained were carried out only with the permission of the All-Union Academy or with its aid.

The situation changed after 1990, when the real opportunity appeared to establish direct scientific ties with any countries of the world, including in the form of contracts and agreements, including the elaboration of joint themes, the establishment of international laboratories, and so on. In 1992 alone we concluded a new agreement with the Hungarian Academy of Sciences and Athens National Polytechnical University and agreed on joint scientific research with scientists of Poland. Steps were taken toward cooperation with scientific centers of Italy, Sweden, Great Britain, France, Germany, China, India, and Turkey. Our traditional ties with the former Soviet republics are also not being severed.

In the same 1992 our Academy of Sciences participated in an international meeting of academies of Great Europe in Stockholm, at which there was an interested discussion on the means of developing cooperation, on the exchange of information and specialists, and on the participation of the academies in the joint elaboration of global problems in such areas as ecology, airspace, and health care. I want to note that at the academies of the countries of Western Europe they are greatly alarmed by the formed situation in science and, in particular, in academic science in the countries of Central and Eastern Europe. In connection with this the conference participants came forth with an appeal to governments and international organizations to support science in every way in the countries of the former Soviet bloc.

This year our Academy has already taken part in the international conference "Scientific Policy in the Service of Great Europe," which was held in Germany. Here the Academy of Sciences of Moldova was recommended for membership in the Association of the European Community for the Support of Science in Eastern Europe.

Last September we became cofounders of the International Association of Academies of Sciences—a nongovernmental self-administered organization that was established for the combining of the efforts of scientists of the sovereign states, which have been newly established on the basis of the former republics of the USSR, and other countries in the solution of the most general scientific problems, for the coordination of scientific strategy, for the support of the most promising research, and for the joint use of unique and expensive equipment. The holding in July of this year in Chisinau of the 18th Congress of the American-Romanian Academy, in the organization of which we took a direct part, is evidence of the increased international authority of the Academy of Sciences of Moldova.

In recent years our ties with scientists of neighboring Romania have been developing particularly fruitfully. At present all the institutes of our Academy are cooperating with Romanian scientific centers, research is being conducted on more than 60 themes.

Thus, at the Academy of Sciences of Moldova the same reorganizational processes are taking place as throughout the republic. We have already achieved much, but much still has to be done so that science would become a more significant support in the accomplishment of the tasks facing the country.

At the same time I cannot but direct attention to the difficult conditions, under which we have to work, and to the problems with which we are faced. First of all I want to indicate the continuing lack of receptivity of the national economy to the achievements of science—an unheard of phenomenon in developed countries. Here the orders of the national economy for scientific research and development have decreased sharply. Whereas in 1985 the amounts paid to our account from the fulfillment of economic contracts came to about a third of the entire amount of financing of the Academy, in 1992 they came to only 7 percent and are continuing to decrease. Today we can offer for introduction more than 60 scientific developments. However, in spite of all our efforts, they are not being taken. The lack of interest in the results of the activity of scientists and, consequently, the decrease of economic contracts are sharply aggravating the financial support of science, which today is based in practice only on budget financing.

We know the difficult financial situation of the republic and understand that Parliament and the Government can allocate for us only very modest funds. Moreover, they are unstable, their real significance is steadily decreasing. The budget allocations for science in our republic in their real significance decreased from 37.6 million rubles in 1990 to 15.6 million rubles in 1992, that is, to less than half, although in nominal terms they increased substantially. For comparison let us note: Last year the allocations for science in Moldova came to only 0.45 percent of the national income of the republic, while, for example, in Germany back in 1989 such allocations came to 2.8 percent of the national income.

Due to financial difficulties first of all the research process is suffering, inasmuch as we cannot acquire the necessary hardware, equipment, chemicals, and other materials.

Due to the lack of assets, especially currency, it is becoming more and more difficult to support international scientific ties, especially trips of our scientists abroad. And I cannot but agree with the president of the Academy of Sciences of Ukraine, who stated that at present a real economic "iron curtain" has arisen before scientists of the former union republics.

Inadequate financing, the lack of housing, the general uncertainty as to the future of science, and, in connection with this, the decline of the prestige of science as a sphere of activity, particularly for talented young people, have given rise in recent years to another problem—the problem of personnel. Scientists are abandoning science, are leaving for other spheres of activity, and are going to other countries. Last year 80 associates from the Academy of Sciences alone left the republic, of them two were corresponding members of the Academy, six were doctors of sciences, and 31 were candidates of sciences. This year only 72 people, who wish to devote themselves to science, were admitted to graduate studies of the Academy.

It is possible to continue the list of today's problems of science, including academic science. However, scientists fully realize that their very own efforts are required for the return to science of its role as the motive force of progress. Today the basic task of academic science is to correctly direct its attention to the solution of the most urgent problems facing the republic, to the strengthening of the ties with sectorial and VUZ science, and to the expansion of international cooperation. The main thing is not to lose the achieved potential and scientific personnel.

NATO, Akademgorodok Seek Areas for Cooperation

947A0022B Moscow ROSSIYSKIYE VESTI in Russian 10 Dec 93 p 3

[Article by Andrey Illarionov, Novosibirsk: "The Peace-Loving Face of NATO in Akademgorodok. Comments on the Search for New Mechanisms of Scientific Collaboration Between the East and the West"]

[Text] It is difficult to impress Akademgorodok in Novosibirsk. At the height of the"cold war" it received de Gaulle and Nixon, and in the spy craze era, Gersh Budker, who was at that time director of the top-secret Institute of Nuclear Physics, liked to invite probable James Bonds to eat Siberian pelmeni [similar to ravioli].

Still, the workshop (for the sake of simplicity let us call it a seminar) attended in late November by the Siberian Department of the Russian Academy of Sciences and NATO's research program department prompted unconcealed interest there. Suggestions on possible points of agreement were somewhat defined when Alain Joubert, director of NATO's program for international scientific

exchange handed out to the seminar participants a list of 60 international conferences and seminars within the framework of the 1994 NATO program on "Science to serve society."

These meetings will deal with such priority interests of mankind as the new generation of immune stimulators, materials science for orthopedic implants, molecular aspects of carcinogenesis, climate sensitivity to radiation perturbations.... Technologies for disarmament, environmental protection, high-tech technologies for high-level investigation of human resources were mentioned as the priority areas of NATO research programs.

Do these remarkable, peaceful programs mean that NATO, the most powerful military group with its objectively inherent power-oriented attitudes, will miraculously change suddenly into some sort of international humanitarian organization?

The answer is easy. Even now, the North Atlantic bloc has something to protect and someone against whom to defend itself. And for a long time it will remain a military entity, and, God willing, let it be only defensive. But expressly this implies that friendly business relations will be established with it.

Of course it was difficult for Siberian scientists to behave as equal partners with representatives from the West at this meeting: the Siberian Department of the Russian Academy of Sciences is in distress, as is all of Russian science. Scientists are engaged in a feverish search for funding. Yet the products of major research, as validly noted by Boris Saltykov, the Russian minister who spoke here, are sometimes sold abroad for outrageously low prices.

But if scientific developments become, at least in part, a commodity, the Siberians must be given their due: some solid results were submitted in the best way. It must be conceded that the Western emissaries arrived here quite well prepared. Upon meeting Professor Gerdt Maier, representative of the FRG aerospace research establishment, I was amazed at how well he was informed, not only about academic, but also industrial research of the Siberian scientists. What was particularly remarkable is that, while the official documents of the seminar listed the Siberian Department of the Russian Academy of Sciences and NATO research services as organizers, the circle of foreign participants at the meeting was much broader. Prominent figures attended: representatives of authoritative international organizations such as UNESCO and Pangis (pan-African working network of geological information systems), the international "Kazimir" project that deals with investigation of rift zones—faults in the earth's crust, the Association for Environmental Study in Rome, International Institute of Systems Analysis in Vienna, and International Institute of Forest Studies in Moscow, headed by Academician Aleksandr Isayev of Siberia.

But it is not at all a matter of listing well-known names and brilliant institutes: the logic of development of science leads increasingly to alliances of researchers from previously separated fields of knowledge and remote continents of our planet.

The study of forests has become in recent years a brilliant example of international and interdisciplinary collaboration.

Unfortunately, it is a common tendency to underestimate the danger that is developing before our eyes. Forest fires, for example, presently alarm mainly those whom they directly affect. Yet there are tens of thousands of forest fires per year on our planet, and the areas involved measure millions of hectares.

An objective scientific assessment is more alarming than the ordinary one. For example, Doctor Johann G. Goldammer from the Max Planck Institute (Freiburg, FRG) observed that the energy of an average forest fire is as great as the power of an atomic bomb. Furthermore, an enormous amount of carbon dioxide is released into the atmosphere, and this alone can cause global changes in the climate. And, according to estimates, within the next few decades it could lead to severe droughts over enormous territories, with all their tragic consequences.

The forest fires that have become more frequent in the United States and Canada, Spain, France and German, Italy, Austria and Switzerland, and, of course, in Siberia, have become serious grounds for scientists from these countries to join forces in order to solve this multifaceted problem. It was learned that such forest fires are caused, to a considerable extent, by man's cavalier intervention in the forest environment, depriving it of self-protection against fire.

Optimization of the condition of forest will require enormous expenditures and time far beyond the lifetime of a single generation of people. Today, however, the main thing is to learn to forecast a forest fire, detect it rapidly, assess it and nip it in the bud.

The unique experiment in Krasnoyarsk Kray last summer was concerned with solving these problems. For the first time anywhere in the world, it was possible to test the diverse knowledge gained in the last decades about forest fires, radiometric and other forecasting methods, assessment and tactics of extinguishing them. This was possible largely because the experiment, which involved a deliberately set forest fire covering a limited area, was carried out by the International Research Center of Boreal Forests in Krasnoyarsk.

One of the remarkable distinctions of development of major Siberian science in our difficult times consists of the fact that, perhaps, the most interesting results are achieved at international research centers, such as the one in Altay, Baykal, and the one dealing with solar and earth physics in East Siberia. There are 16 such centers today, and there will be more than 20 in the next few years. They use both the effect of integration of ideas and knowhow of the West and the East, and some financial aid from the West. Siberian science is an example of the

experience and volume of collaboration with scientists from distant lands. Here, an increasing number of creative contacts are being established directly by research teams, in addition to officials.

As for collaboration with NATO, the main objective of the meeting in Akademgorodok was to develop programs for long-term scientific collaboration, rather than to receive immediately grants for participation in NATO conferences and seminars.

And a start has been made.

Bureaucracy Obstructs Hi-Tech Sales, Defense Conversion

947A0022A Moscow NEZAVISIMAYA GAZETA in Russian 7 Dec 93 p 6

[Interview with Vladimir Stolypin, candidate for deputy to Gosduma, "Bureaucrats Are Impeding Market Relations—Isotopes Could Be Painlessly Sold to the West." Conversion by Nikolay Ulyanov; first paragraph is NEZAVISIMAYA GAZETA introduction]

[Text] Quite a lot has already been said and written about the problems of converting enterprises and institutes in the defense industries. Enterprises that produced tank engines are converting to production of metalware, aircraft parts manufacturers are setting up shops to produce synthetic socks. In general, some solution is being found in each specific case. But what is to be done about respecialization of associations in the atomic energy system, has any positive experience been gained in this field? This and other questions are answered by Vladimir Stolypin, recently chief of the laboratory for systems analysis in economics at the Institute of Atomic Energy imeni Kurchatov, and presently a candidate for deputy to the GOSDUMA.

Question: Do you think there is any possibility of switching high-tech industries that serviced our atomic science for decades to peacetime tracks?

Answer: Of course, there are possibilities. And they are revealed when one gains understanding of what is needed on the market so as to convert, relatively painlessly, but of course not without investment, many sectors and relevant industries and advance with our products to the international market.

Let me cite an example. We all know of the pioneering work carried out by Soviet nuclear physicists on isotopes separation. This is related to the fact that highly enriched uranium was needed, and technologies were developed within the limits of this project that are still in the fore of worldwide science. It would seem that, at least in part, these technologies could be used to obtain ultrapure stable isotopes that are in enormous demand on the world market. This is the simplest method of conversion, since production has already been set up; we only need to establish small marketing services to explore the demand market and offer this product. Stable isotopes are not products for wartime use, and they are used in the West chiefly for early detection of diseases. Most serious foreign clinics have instruments that operate on the basis of stable isotopes. Suddenly there is a paradox: export is banned.

Question: Why?

Answer: Bureaucrats believe that, since the Institute of Atomic energy was concerned with these matters, whatever it does is subject to additional permission through the pertinent agencies.

Question: To what agencies are you referring?

Answer: At first, to the Ministry of Atomic Energy, then government bureaucrats who previously worked in the Ministry of Industry. For example, Chernomyrdin has a deputy who endorses documents concerning atomic matters. And all bureaucrats will impede the sale of the products of conversion operations in order to retain for a longer time control of this direction of work.

Question: Aside from stable isotopes, what other developments of the Kurchatov Institute may be considered for export?

Answer: This is not an easy question, and it should become the subject of meticulous analysis. Obviously, there can be no question of exporting uranium, we have saturated the market with it to such an extent that the problem now is how to limit its sale, even for energy purposes. Even now, we can sell with great success the technologies for recovering ultrathin film, ultrapure filters, etc. We could also trade in products made of titanium and zirconium, for which there is a great demand on the world market. But with the disintegration of the Union, Russia was deprived of the possibility of mining for titanium and zirconium ore, which used to come from the Ukraine for the needs of Soviet industry. Enterprises dealing with processing these ores have actually shut down. The government should invest enough funds for speedy development of Russian titanium and zirconium deposits, and prevent the break of technological chains, thereby multiplying export capital! But the government has allocated barely enough to carry out scheduled geological exploration.

Question: Now a question that is not directly related to the topic of our conversation, but that has a bearing on conversion of the defense industry. It is probably not by chance that you have decided to run for office in the North-Western District of the capital, where the percentage of residents working in defense plans is considerably higher than in Moscow as a whole?

Answer: You are absolutely right. One could even arbitrarily divide the district's residents on the basis of their involvement in specific defense fields. Khoroshevskiy Rayon consists of research organizations related to the defense industry. Tushinskiy Rayon, to machine building organizations that service defense. I believe that my experience and knowledge in the field of conversion of high-tech industries are not unimportant to my supporters.

Nuclear Weapons Scientist Discusses Cooperation With U.S.

947A0020A Moscow RABOCHAYA TRIBUNA in Russian 26 Nov 93 p 1

[Interview between Vladimir Gubarev and Vladimir Chernyshev, doctor of physical and mathematical sciences: "This Explosion Is an Echo of the Future"; the first five paragraphs are an introduction]

[Text] Vladimir Chebyshev, doctor of physical and mathematical sciences, tells of the importance of the first Russian-American experiment carried out at the Russian Federal Nuclear Center.

"In its importance that which occurred at work site No. 3 at Arzamas-16 is comparable to the launch of the first artificial earth satellite," said the American professor Steven Younger, "and I do not exaggerate a whit because that work which we are engaged in is of enormous importance for the fate of civilization, it is no less inferior to space research, and therefore I have the right to make such a comparison with the launch of the satellite..."

We will not dispute the American professor; he possibly exaggerates, but it is possible to understand him: for many months he "fought" the higher powers in the United States for the "right" to carry out joint work with the Russians (they have the same problems as we do!) and therefore the successful completion of the experiment so exhilarated Professor Younger. After all, this also justified the efforts made and what is most important, the doors were now flung wide open for future cooperation.

On our side the director was Professor Chernyshev. And what is there to hide; to a great extent due to Vladimir Konstantinovich everything went off brilliantly. After all, it was precisely he who was not only the ideological inspiration of the devised program, but also its organizer and executor. It was precisely the "Chernyshev team,"riveted for many years on a single goal, which realized the "launch of the first joint 'thermonuclear satellite' in the history of the two countries—Russia and the United States."

Our conversation with the scientist began with the traditional question:

Gubarev: Who are you?

Chernyshev: Division head at the All-Union Scientific Research Institute of Experimental Physics, doctor of physical and mathematical sciences. I have been working here since 1950, since immediately after graduation from the Moscow Physical Engineering Institute...

Gubarev: And how did you chance to come here?

Chernyshev: I was chosen at the institute. Evidently someone took notice of me. I graduated from the institute with "flying colors."

Gubarev: Did you know where you were going?

Chernyshev: When I asked about this they told me that it was somewhere within the boundaries of Gorkiy Oblast.

Gubarev: What was your first impression?

Chernyshev: Very unusual... It was winter, January. There was a great deal of snow. The streets were very well plowed. Young soldiers in sheepskin coats maintained order. I felt concern about who lived here. And the living conditions were very comfortable for the young specialists who came here. Don't forget that 1950 had come and you can imagine what the situation was in the country... We were quartered in hotel No. 2. Comfortable conditions, exactly the opposite from how we lived in Moscow! When we arrived in the dining hall we were surprised at the choice of dishes. And our first impression was that we had arrived in a "corner of paradise."

Gubarev: And the next day?

Chernyshev: Work began.

Gubarev: Was it also like paradise?

Chernyshev: It was really work, very interesting, and I recall those years with satisfaction. The people paid no heed to time. It was commonplace to return from the work site sometime in the middle of the night and even toward dawn. Everyone worked with enthusiasm and each understood that an extremely important task was being performed. None of us knew precisely what it was, but we guessed vaguely...

Gubarev: And when you learned for the first time that you were working on a weapon?

Chernyshev: The first year I vaguely guessed the nature of the work and a little later began to participate in discussions of the problems and naturally I understood that we were dealing with the manufacture of a nuclear weapon. I began to learn from Mikhail Yakovlevich Vasilyev. He was an exceptional lover of work, a fine experimenter, a very honest person... I always remember him with great warmth. He instilled in us a feeling of responsibility for the delegated task. He was our teacher.

A little later in the course of the work I had the opportunity to interact with Yuliy Borisovich Khariton. The meetings with him, I believe, left an indelible impression not only on me, but also on all the young specialists.

Gubarev: You are the experimenter. You did not know in detail about similar work which had been carried out in the United States. So how come you were at a very high level and were on a par with the Americans?

Chernyshev: Many specialists of our institute are very high-class specialists. And each in his own field can be proud of what he has done. Sooner or later each will be asked the question; "And what did you do?" And if you judge honestly, then the fingers on one hand will suffice to list the tasks done, but each of these tasks performed will bring you satisfaction because it was of a high class.

And more than just one or two tens of specialists at our institute can be proud of such results. Now, looking backward and comparing the work of our specialists with those at other institutes, you are convinced time and again that a unique scientific center was established here with an enormous scientific-technical capability.

Gubarev: You constantly set off explosions. And were there many such experiments?

Chernyshev: Many thousands. Especially during the first years we worked day and night and therefore there were a great many explosions.

Gubarev: And just why did you set off the explosions?

Chernyshev: Even the most magnificent theoreticians cannot foresee everything. Usually there are close to the truth, but all the fascination is that you get a wet film and you see how the theoretical computations and the experimental results differ substantially because the phenomena with which you are dealing are nevertheless very complex. Mankind also has very little work experience in this field, after all, we are talking about high energy densities when a high concentration of energy, high temperatures and pressures are attained in short time intervals. The behavior of matter is very difficult to predict under these conditions.

Moreover, when you're talking about weapons, every step requires careful and thorough checking. If you look backward once again and attempt to determine how many useless and unnecessary experiments there were, their number is very small. But they also were necessary in order to understand how to move forward.

Gubarev: Probably it was pleasing for the experimenter to say: Dear Academicians Sakharov and Zeldovich, were you mistaken?

Chernyshev: This is a natural reaction... But it was far more pleasant when together with the theoreticians you make your way toward the truth. I had the satisfaction of working with both Andrey Dmitriyevich Sakharov and Igor Yevgenyevich Tamm. And I keep only bright impressions from these meetings.

Incidentally, when the first experiments with magnetic commulation were discussed with both Sakharov and Tamm they very naturally and simply sensed what was not understood. Andrey Dmitriyevich frequently repeated: "Let's think together!" He was a very magnetic personality, he understood us and discussed any problems as equals. And new ideas and new experiments took shape. Thus it was, for example, in the development of magnetic flux generators.

Gubarev: Was an idea of Sakharov the basis for the present-day experiment?

Chernyshev: Andrey Dmitriyevich proposed the idea of magnetic commulation in 1951.

Gubarev: Pardon me for interrupting, but in ordinary terms what is "magnetic commulation"?

Chernyshev: This is the compression of a magnetic flux in a circuit by means of external forces. Some of the energy is transformed into magnetic field energy, and as a result of circuit compression the current sharply increases, which makes it possible to use such devices as generators of superpowerful magnetic fields. In this field great successes were attained by the now deceased Academician Aleksandr Ivanovich Pavlovskiy. In these same devices it is possible to obtain great supplies of energy and high flux densities during short time intervals.

In 1951 Sakharov stated that in principle it is possible to use magnetic commulation for producing a thermonuclear burst. To me this thought was very attractive. However, it was necessary to overcome enormous difficulties. Although during the first ten years some apparatus appeared, it already was clear that in order to produce a thermonuclear burst the power had to be increased a hundredfold. I had the idea of a disk explosively driven magnetic field generator and it began to take shape in 1961.

Over the course of some time we were the only ones who had this technology. Our results were reported for the first time at an international conference in 1983. Unfortunately, attempts of American researchers to achieve the same results were not crowned with success. Naturally, in the report we did not give what is related to "know-how." Thus, ten years have passed and now the Americans are undertaking energetic attempts to achieve that which we attained in 1983.

Gubarev: How do you explain their lag?

Chernyshev: Several factors. It seems to me that the Russian research was more innovative, because, however paradoxical it may seem, they worked under more difficult conditions. It is no secret that good outfitting with personal computers enables Americans to make many calculations and determinations, but at the same time "slows down" the development of thought.

Gubarev: It is clear what cooperation gives to the Americans. But what advantage is there to you?

Chernyshev: First of all, we understand the level at which they are. We are adopting a number of methods which we did not know of earlier and most importantly, are solving many thermonuclear synthesis problems. Indeed, even such a rich country as the United States by itself, without broad international cooperation, is not capable of solving this problem.

Gubarev: I propose such a project. We detonate a nuclear charge, transform the energy in your generator, direct it into a beaker filled with water, obtain a thermonuclear burst, and then direct this enormous energy to an electric power plant. The scheme seems so elementary, so what is fallacious about it?

Chernyshev: The fact that in the very first stage you use a fission reaction. Our task, however, is to obtain "clean energy." It is assumed that superpowerful magnetic generators will be used as the triggering device. In these generators it is the energy of an explosion, not the energy of fission, which is the operative agent; then a system is triggered in which there also is no fissionable materials and as a result of synthesis we obtain energy, some of which will be used for the next thermonuclear cycle and all the rest is directed for the needs of people.

Gubarev: Thus, the Americans nevertheless were doubtful in the first stage?

Chernyshev: This was related to the successes in developing explosively driven magnetic field generators. The history of their development dates way back. The first abstracts were submitted to an international conference as early as 1965. Andrey Dmitriyevich Sakharov even then insisted that Pavlovskiy and I without fail go to the conference and tell about our successes in this field. And here then began a game of "leap frog" with the trip, since after all we worked at a secret center. First they told us: "Go!", but after a month had passed it was "No, don't go!"

Finally, Aleksandr Ivanovich and I were called to Moscow for formalization of the passports and there again it was "yes," then "no." Finally Pavlovskiy and I became weary of all this, climbed into an aircraft and flew off to Arzamas-16. And our interests at the conference were represented at the conference by Sergey Petrovich Kapitsa. On his return he stated that our reports were very greatly anticipated there, interest was enormous and our results made a very strong impression on the Americans.

There was still another conference in Washington in 1979. We also presented a series of reports there. And again they did not allow us to go and therefore the Americans asked with interest: "If we come to Russia will we still not be able to meet up with the authors?" Unfortunately, the answer of our specialists was evasive... And therefore the Americans concluded that "Pavlovskiy and Chernyshev" did not exist and therefore when we appeared before them for the first time they were exceedingly surprised. Since 1983 we have already been regularly meeting with our American colleagues and such contacts are enabling us to learn better not only about one another, but also about the essence of that problem which we are solving together.

Gubarev: What were your impressions of Los Alamos?

Chernyshev: I was there twice. Both centers—Los Alamos and ours—somehow are very similar to one another. There is a special aura which prevails in both places. The strong sense of being cut off from the rest of the world. The very same system of passes and being photographed. And at the same time the creative atmosphere of scientific research. The Americans, the same as ourselves, are inspired in their work, are proud of it... We speak in different languages but our thoughts and actions are similar, very close. And therefore we so easily understand one another.

Gubarev: And you did not have the sensation that you were on the different side of a barricade? They made weapons in order to annihilate us and you made weapons to annihilate them?

Chernyshev: I think that you yourself can answer this question... It was a pleasure for us to confirm that the team of specialists gathered at Arzamas-16 in no way is inferior to that which worked beyond the ocean. And that we were capable of solving not only the same, but also even more complex problems. The sensation that you work in such a strong institute as ours was pleasant, I won't downplay that! I have been in many scientific institutes and at large scientific centers: in Moscow, at Leningrad, in the Urals and in Siberia, and I have always felt that our institute was for me.

Gubarev: I'd like to ask a more direct question: do you not regret that you have spent your entire life working on nuclear weapons?

Chernyshev: That was the duty of the times and I had to engage in it.

Gubarev: Do you feel that weapons work advanced different branches of physics and thereby facilitated the development of science in general?

Chernyshev: To be sure. Work on military projects always is carried out at the level of the latest advances. And without question there also is a payoff for all related fields. But at the same time each of us had the conviction that mankind would find sufficient common sense never to put nuclear weapons to use.

Gubarev: You were at the tests? What were your sensations?

Chernyshev: Mixed feelings. But one feeling nevertheless predominated. It was necessary that this weapon never be used. That was the principal conclusion.

Gubarev: What were your impressions from work with the Americans?

Chernyshev: It was important that such contacts be made strictly on an equal basis. If the arrangement is set up in that way everything is taken with understanding and respect. And honesty is necessary: this is possible and impossible.

Gubarev: The first experiment was behind you. What then?

Chernyshev: The Americans are proposing a program for the next two years. This is research on the physics of magnetized plasma. We are very interested in using American diagnostics, which in some respects is superior to ours. They have better computer resources and because of this—better processing of the results.

But at the same they have shortcomings. They, I repeat, are "loaded down" with computers and therefore they don't want to think a little without having recourse to them. "So there is no bad without good"; in this case some advantages appeared for us. The joint program on our theme is definite and clear for the coming years.

Gubarev: For example, the "thermonuclear satellite." And what place is occupied by "tokamaks"?

Chernyshev: I regularly visited the Atomic Energy Institute. Even at the time when the work was headed by Lev Andreyevich Artsimovich. And even then it seemed to me that this path not only was long, but also very expensive. Even if you bear in mind that our "boublik" would be five meters in diameter and with a cross section of about a meter, it can be counted on only as an approximation, an approach to ignition of the "thermonuclear satellite," and in order to obtain it the dimensions must be increased by an order of magnitude—by a factor of ten!

A structure of cyclonic dimensions is obtained. It requires investments of more than one billion dollars. It is impossible for any individual country to realize such a project by itself and therefore different countries are cooperating. The entire approach is based on the prolonged containment of plasma. This is a very long-term and costly program. True, this is a stationary system in which the plasma will burn a long time.

To be sure, a great many problems appear which are related to the instabilities of plasma, its thrusting onto walls, cooling, etc. And therefore for those who in their spirit feel closer to pulsed systems an apparatus of such a type has no appeal.

Gubarev: What about lasers?

Chernyshev: These systems are as complex as the tokamak. There must be careful regulation of each beam. Should an earthquake occur anywhere an adjustment must be made and therefore there is a need for some kind of floating platform, etc. There also other kinds of apparatus which are equally complex and expensive. And each of them requires powerful energy sources and they exceed the power of all electric power plants on the planet by many times...

However, the systems which we proposed—I have in mind explosively driven magnetic field generators—make it possible to achieve ignition and even a demonstration experiment far more simply and less expensively. And indeed, before investing billions of dollars in a laser "thermonuclear satellite," in an apparatus with ion beams, it must be understood: suddenly some restrictions show up which we do not suspect today! The results of experiments, as well as calculations, show that explosively driven magnetic field generators are the shortest path to obtaining ignition.

Fortunately, many American colleagues also share such a point of view... Once we told of our research, the course of our investigations, to Academicians Khariton, Velikhov and Aleksandrov. They insisted that we continue to work because if success comes it will be equal to the breakthrough into space. That's what they said...

They supported us very strongly, but now the events of recent years have exerted an influence on our work and has slowed it down. But a skeleton of specialists for the time being remains and this is very important—all are enthusiastic, they understand that a breakthrough into a fundamentally new field of science and technical progress is possible. This is a noble objective. I think that our mission will be accomplished if we come closer to the long-cherished dream that gives meaning to our life and work.

RAS Playing Inactive Role in Supreme Soviet Elections

947A0013B Moscow SEGODNYA in Russian
11 Nov 93 p 8

[Article by Vera Romanova: "On the Eve of the Election the Presidium of the RAS Is Displaying Inertia. Only 'Yabloko' Is Prepared To Think About Basic Science"]

[Text] Perhaps, the Russian Academy of Sciences (RAS) has become one of the few organizations that are not taking an active part in the election campaign. Of course, individual representatives of it are members of various parties and blocks. But here they are directing attention not at all to the interests of their colleagues. As for candidates directly from the RAS, it as a public organization does not have the right to nominate them.

In principle such a situation is very convenient for the leadership of the academy, which does not tire of repeating at every opportunity that the RAS is far from politics. Nevertheless the academy simply needs to have "its own" people in the new parliament. In its present financial situation and given the uncertainty of the future of many institutes and associates it is important as never before to have a lobby in the legislative body of power, and not simply good relations with its representatives. Therefore, the traditional conservatism of the RAS and the reluctance to take part in the political struggle in this case exceed a certain bound and can be interpreted as passivity, which subsequently can adversely affect its fate.

Of course, no one is making an appeal to break laws and to nominate candidates from the academy. However, the members of the Presidium, who are very tempted, cannot but know of other possibilities. An attempt was also made to use one of them.

At the meeting at the Institute of General and Inorganic Chemistry of the RAS Vice President Oleg Nefedov and Chief Scientific Secretary of the RAS Igor Makarov presented to the associates the candidate from the Universitetskiy District of the capital for the State Duma, Vice Premier of the Government of Moscow and Chairman of the Science Council of Moscow Aleksandr Braginskiy. The 45-year-old candidate (in recent times

he has been known as a person, who was in the captivity of the supporters of Rutskoy and Khasbulatov during the events of 3-4 October) has already done much for the RAS. In many respects the adoption of the program "Science for Moscow," under which the city authorities are financing projects that are of interest for them, depended on him. This program has already been in effect for several months and has yielded a profit both for scientists and for the capital. Moreover, owing to the efforts of Aleksandr Braginskiy the rent for a number of scientific institutions was fixed at the level of the operating expenses, preferential terms for the payment for electric power were introduced, several scientists received apartments, and new health care institutions were put into operation.

The channeling of state budget assets not only into "the reform of the judicial and law enforcement system and the army and the support of culture," but also into "the strengthening of basic science and education" is mentioned in Braginskiy's election program. Therefore, such a member of the State Duma is very important for the presidium of the RAS, although he will devote not all of his time to the defending of the interests of the academy. For the present it is not clear how in the future the RAS will support Aleksandr Braginskiy.

However, one member of parliament, of course, is not enough for the academy. Some more global actions are needed. And what is the most amazing thing, they have been carried out, true, not by the leadership of the RAS.

Candidate of Physical Mathematical Sciences Aleksey Zakharov, deputy chairman of the council of the trade union of workers of the academy, prepared proposals on the preservation of Russian basic science during the period of economic reforms, in which he evaluated the present situation and examined the problems of financing, property, legal space, and personnel. This document was sent by the author to all the election blocs. However, only the "Yablinskiy-Boldyrev-Lukin" bloc agreed to use it.

There now appear in the draft of the election program of this bloc: "the establishment of a fixed share of the revenues of the state budget as the lower limit of the financing of science, using the mechanism of the coordination of the interests of all budget-carried sectors; the use of the selective support of scientific collectives during the competitive selection of projects and their independent examination; the adoption of a special program of the privatization of state property in the sphere of science; the introduction of the preferential taxation of the assets, which are channeled into funds for the support of science and the higher school (including from abroad)."

One question arises: Why is the chairman of the trade union, who, though he is defending the interests of scientists, does not supervise them, preparing his own proposals on how to preserve science? Why has the presidium, in whose hands are power and a large number of other opportunities, thus far not taken the same or a similar step? What is this—indifference, the loss of hope for the solution of problems at the parliamentary level or, through inertia, the desire as before to stew in one's own juice and in necessary instances to use personal contacts?

Nuclear Scientists Warn of Labor Strikes, Nuclear Accidents

947A0013A Moscow LITERATURNAYA GAZETA in Russian 3 Nov 93 p 12

[Article by Eduard Filatyev under the rubric "Scientific Surroundings": "Physicists Are No Longer Joking"—first paragraph is LITERATURNAYA GAZETA introduction]

[Text] Russia did not shudder, although this summer the Chernobyl disaster again began to be in the air. The inconceivable, exceptional event occurred casually, with the most sparse information.

The sensation of the year, if not of the decade, is like this: At two closed cities of Russian nuclear physicists—Arzamas-16 and Chelyabinsk-70—at meetings of many thousands a desperate word began to resound loudly: STRIKE. Warning notices were sent to the leadership of the country.

True, in the first official explanations of executives of the institutes it was specified: There is not a strike, but merely a prestrike situation. Is there a difference? Indeed, I do not know if a nuclear physicist comes near a "piece of work," excuse me, not having eaten because of two- to three-month delays of pay.

Who does not remember the "secret physicist" Ilya Kulikov from Rommovskiy's "Nine Days of One Year" in the brilliant performance of I. Smoktunovskiy? An elegant, impressive, witty theoretical physicist "smelling like a barber," at whose service there was everything: from a seat on any scheduled airliner to enormous laboratories in secret underground bunkers.

Recently I had occasion to see him again. Of course, not Kulikov-Smoktunovskiy personally, but one of his prototypes. A man, who had become somewhat heavy, but as before was not losing heart, and was self-confident, left a single room of a hotel of the capital, which hardly anyone knows and is located in an old building on Maksim Gorkiy Embankment. An elegant, impressive, witty man who smelled of cologne bought with currency and expensive imported cognac.

The appearance of a living atomic physicist evoked involuntary admiration:

"What a fine 'secret physicist'! And the years have not had an effect on him! A hero of any time!" "He is not at all secret," the woman manager on duty replied in a deferential whisper. "And he is not at all a physicist, but a cooperative member, a businessman."

The picture is a familiar one. Today well-to-do people get everything! They get the best rooms with a telephone and a television. They get the keys to the shower room first of all. While the real "secret" people in their

semisecret departmental hotel patiently endure crowding in common rooms without a telephone and without a television.

And these are our celebrated forgers of the nuclear shield of Russia!

"What forgers they are!" a familiar "official" from the Ministry of Atomic Energy waved his hand. "How many years they have had nothing to do! It would be a good thing if they have not yet forgotten how to 'forge'! The wage of a scientific associate in Arzamas-16 on the average is half as much as that of a worker of the local sobering-up station. They are scarcely releasing money for direct work, they have cut travel allowances, having forced people to change from airplane to train, and have cut off financing for social needs."

They have put nuclear physicists on the same footing as medical personnel and teachers, physicians and librarians, engineers and agronomists. And they seem to have done so quite justly. It is now hard for everyone, hence, it is also necessary to share the burdens of life impartially—equally. Everyone is the same kind of people.

Yes, the same. But who will relieve them of responsibility for weapons that are capable in a matter of moments of wiping millions of human lives from the face of earth? And life on earth itself in addition.

Incidentally, in the past, in spite of "the tireless concern of the party and government," secret nuclear weapons developers did not show off very much. They lived normally. A little bit better, perhaps, than the average level, but not more than that.

In one of the laboratories of what is called "site 20" of the closed city Chelyabinsk-70 there stands an enormous instrument the height of a multistory building. It has a romantic name—Igur. At times they take visitors here. Even foreigners. Last year then U.S. Secretary of State James Baker also visited here.

I do not know what kind of impression the multistory Igur made on the high-ranking American, but the hopeless obsolescence of the console, at which research physicists sit, is immediately obvious to many of our visitors. The measuring instruments, buttons, tumbler switches, microphones, tables, chairs, door handles, plates with inscriptions—in short, the entire design as if came from the times of the same Kulikovs and since then has never been updated.

The console of the Japanese boiler house looks like a 21th century spaceship. But then in its furnaces they burn nothing but ordinary household garbage.

For decades, while trying first to catch up with, and then to outdistance the overseas competitor, we invested the lion's share of the assets being released for nuclear affairs in "warheads" themselves. While we invested in instruments and in other "design" and in human services only what was left of the main amount.

A few examples. The do-it-yourself building at the same "site 20," which in common parlance is called a "lean-to," is stuffed to capacity with expensive laser equipment. Here they are trying to solve the problem of the century—to learn to control thermonuclear fusion. Fine! More than that, splendid!

But it is stuffy and crowded in the "lean-to." There is no room for the relaxation of personnel, there are no cloak room and lavatory.

The physicists go to eat in a magnificent dining room, the two-story building of which has been moved several hundred meters beyond the territory of the "zone." Secrecy! It is categorically prohibited to allow the cooks and food servers beyond the barbed wire of "site 20"! And one can understand this. But....

Was it really hard to bring the building of the dining room close to the integrated receiving center or if only to extend to it a covered gallery so that the people going to dinner would not have to jump over puddles or fall into snowdrifts?

We go farther. On the industrial site adjacent to "site 20" there is a unit for the production of optical fiber. This is the pride of the institute, its present pride, that is why they also take visitors here.

Once a group of television people from the capital had occasion to film the optical fiber equipment in operation.

"But would it be possible," the director asked, "for the engineer-physicists all to wear white laboratory coats?"

"Of course!" followed the response. "No problem!"

In a minute the operator filmed a man in a white laboratory coat. After a while he filmed a second and third man. The trained eye immediately took note that the same number—2906—was embroidered on all the laboratory coats. At any rate I was interested:

"Is this by any chance not the secret designation of something?"

"Oh, come on!" the engineer-physicists scoffed. "This is the personal account of Ulyanov. A clock number, in short. And the laboratory coat is also his—Ilich's."

It turned out that for the entire laboratory there was just a single white laboratory coat. Of scientific associate Anatoliy Ilich Ulyanov.

Once an article of theoretical physicist V. Bekhterev appeared in the factory newspaper of the closed city Chelyabinsk-70—NASHA GAZETA. In it alarm was expressed with regard to the fact that the executives of the nuclear institute on the institute production base had formed several limited liability companies. The administrators had begun, as they say, to make money.

It is possible to understand them in purely human terms: The leadership was sick of receiving—moreover, with constant delays—a symbolic wage, it decided to set its financial situation straight.

But just why, the author of the article wondered, did officials of the basic structural subdivisions of the institute and leading specialists of the operations on nuclear weapons decide suddenly to take up private entrepreneurial activity, which hardly differs from their official duties? And why in the charter of the company is it not stipulated that all the operations, which are connected with this activity, should be performed during nonworking time?

In addition to this there is an irrepressible wanderlust. In the same NASHA GAZETA, in particular, it was stated: "In the last three years he (V. Nechay, director of the nuclear institute—E.F.) directed the institute from abroad in all for about a year."

Further V. Bekhterev concluded: "We have not less than 10 specialists who are capable of performing work in the United States no less successfully than the director. Is it not easier to grant the present director a good wage and to oblige him to deal only with the affairs of the institute?! Or even more simply to hire another director and to appoint the present one as his deputy for foreign relations?!"

It goes without saying that such insolence, which came in addition from the mouth of a rank and file member of the collective—I say, some senior scientific associate with 30 years of service!—could not go without consequences. And a hail of the most diverse retributions fell on the head of the too emboldened physicist. About 10 years ago they probably would have simply wiped him from the face of earth. But, fortunately, the times have changed, and V. Bekhterev not only survived, but also proposed his candidacy for the post of mayor of Chelyabinsk-70. And in the spring of this year he won!

However, the opposing side also satisfied, as they say, its own interests: Foreign trips are continuing. Now they are going with their wives.

Outside Russia they have even begun to take into account this "weakness" of our executives. Thus, for example, when China invited us to exchange delegations of nuclear physicists, they sent responsible workers of Chelyabinsk-70 invitations to visit the PRC together with their helpmates. Eight Chinese physicists came to our country with a return visit. For them this trip was an ordinary scientific mission. For us it was a tourist voyage of "nuclear generals" with their spouses.

In recent decades, as specialists claim, we have made such a number of nuclear weapons that if today, now we began their complete disassembly and destruction and worked in so doing around the clock at full tilt, all the same by 2000 it would not be possible to eliminate the entire arsenal. And a bit of work would remain for the 21st century!

As in every sector, in this one, which up to now has been silent and has been made most shiny, its own organ of self-protection has appeared. It is called the SRYaZ—the union of developers of nuclear warheads. For a year and a half the members of the SRYaZ have been sending letters to the highest instances, trying to familiarize the authorities with the critical situation in their sector. But all the attempts of the "secret physicists" to knock at the doors of the offices of the "first people" until heard, alas, have been unsuccessful.

Meanwhile they want to say very little. Every nuclear warhead, the members of the SRYaZ recall, has a specific term of reliability, upon the expiration of which the warhead is liable to disassembly and partial destruction. It is necessary to turn over the fissionable materials for special storage.

This entire process should take place under the strictest monitoring of specialists. The ones who conceived and developed this nuclear warhead. The ones who know it thoroughly. No other nuclear specialist—be it an American, a Frenchman or an Englishman—will be able to guarantee the safety of the disassembly of our bombs or projectiles. For the simple reason that our nuclear secrets, which have been incorporated in one warhead or another, are known only to its developers.

Only one formula is acceptable here: As long as if only one nuclear warhead exists, specialists, who know it in detail and are capable owing to this of guaranteeing us complete safety, should serve.

It is, it would seem, so simple, so logical. But no, the collapse of the Russian nuclear sector is continuing.

On 4 August of this year a telegram from Chelyabenergo, in which in categorical form they were ordered by the 10th of the month to pay off the debt on the charge for used electricity, arrived at the nuclear center in Chelyabinsk-70. Otherwise, it was stated in the telegram, the closed city would be disconnected from the electric power network!

A most unique document of our market era! A most honorable place in the future museum of nuclear physics should by right belong to it. Next to photographs of the authors of the telegram. Do they realize what can happen a second after the closed city ceases to receive electric power?

The noose on the neck of closed nuclear cities is being drawn tighter and tighter. A little more and complete financial collapse will set in, after which the "secret physicists," who have been thrown to the mercy of fate, will finally scatter in different directions. And then it will remain for us just to wait until it expires—this term of reliability of nuclear warheads. But even physicists are not joking with this.

CHEMISTRY

Kinetics of Oxidation-Reduction Reactions of U, Np, and Pu in TBF Solutions. Part 5. Oxidation of U(IV) With Nitric Acid

937M0174F St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 12-19

[Article by V. S. Koltunov, K. M. Frolov, and M. Yu. Sinev; UDC 546.799.3]

[Abstract] Quantitative data on the rates of oxidation-reduction reactions of U, Np, and Pu in organic solutions of tributyl phosphate (TBF) are needed for mathematic modeling of redox processes in the extraction technology of spent nuclear fuel, as well as having independent scientific interest. Tetravalent uranium as a reducing agent for Pu and Np ions is used widely and has many advantages, one being the possibility of conducting the reaction in both aqueous and organic phases, but at the same time the capability of U(VI) of being extracted with TBF is a main cause of the nonproductive consumption of U(IV) owing to its oxidation with nitric acid in the TBF phase. Various attempts have been made to study the kinetics of U(IV) oxidation with nitric acid in TBF, and it has been established that this reaction is autocatalytic. After an induction period the reaction becomes first order and its rate is little affected by the concentration of nitric acid in TBF. In the present work a differential equation was developed for this reaction. Activation energy for the first stage was determined to be 65.3 kJ/mole. The reaction mechanism includes parallel flowing slow stages of interaction of UOH^{+3} ions with HNO_2 molecules and U^{+4} ions with nitronium perchlorate. Figures 3; references 9: 6 Russian, 3 Western.

Kinetics of Reactions of Np and Pu Ions With Hydrazine Derivatives. Part 10. Reduction of Np(VI) With Isopropyhydrazine

937M0174G St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 20-24

[Article by S. M. Baranov, V. S. Koltunov, and T. P. Zharova; UDC 546.799.3]

[Abstract] A correlation has been detected between the reactivity of organic hydrazine derivatives and the inductive properties of the radical-substituent as in the reaction with NpO^{+22} ions. It has been demonstrated that a lengthening the hydrocarbon chain, particularly from methyl to ethylhydrazine, results in a lowering in the reduction rate of Np(VI). It may thus be expected that further substitution of the ethyl group with propyl would lead to further reduction in the reactivity of hydrazine. In the present work the reaction rate constant for the reduction of Np(VI) to Np(V) with isopropoyhydrazine was determined to be 19 $liter^{0.1}/mole^{0.1}$ at 25.2° C and ionic strength $\mu = 2$. Activation energy and entropy are E = 69.4 kJ/mole, $\Delta S^{\circ} = 30$ J/moleK. The reaction mechanism fits a general oxidation mechanism for hydrazine derivatives with single electron oxidizers. Figures 2; references 5: 4 Russian, 1 Western.

Kinetics of Reaction of Np and Pu Ions With Hydrazine Derivatives. Part 11. Reduction of Np(VI) With ter-Butylhydrazine

937M0174H St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 25-30

[Article by V. S. Koltunov, S. M. Baranov, and T. P. Zharova; UDC 545.799.3]

[Abstract] In previous study [cf. 937M0174G] of the reaction kinetics of Np(VI) with isopropylhydrazine it was demonstrated the reactivity of the latter lies somewhere between that of hydrazine and ethylhydrazine, depending on the corresponding dampening of the positive inductive effect in the series methyl- ethyl-propyl. The present work is a further study of the relationship between reactivity and induction effect of the radical substituent in the hydrazine molecule, using ter- butylhydrazine. The reaction rate constant is 518 $mole^{0.1}/liter^{0.1}$min. at 25° C and ionic strength $\mu = 2$. Activation energy and entropy are E = 61 kJ/mole and $\Delta S^{\circ} = 60$ J/moleK. A correlation was found to exist between the Np(VI)-hydrazine reaction rate constant and the Taft induction constant. Figure 1; references 14: 11 Russian, 3 Western.

Kinetics of Reactions of Np and Pu Ions With Hydrazine Derivatives. Part 12. Reaction Between Np(VI) and Phenylhydrazine

937M0174I St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 31-38

[Article by V. S. Koltunov, S. M. Baranov, and T. P. Zharova; UDC 545.799.3]

[Abstract] The reactivity of organic hydrazine derivatives is determined by two factors, viz. the induction effect of the substituent radical and the basicity of the substituted hydrazine. The basicity constant of phenylhydrazine is 5.4×10^{-6}, i.e. three orders higher than the basicity constant for hydrazine. This should lead to an acceleration in the reduction of Np(VI). Also, the phenyl group has a negative induction effect and its introduction to the hydrazine molecule results in a decrease in electron density at the nitrogen atom and a deceleration in the reduction reaction. In the present work the rate constant for reduction of Np(VI) with phenylhydrazine in nitric acid was determined to be 1620 $liter^{0.6}/mole^{0.6}$min. Activation energy and entropy are 31.4 kJ/mole and 83 J/mole, respectively. The change in reaction rate of Np(VI) reduction when changing from an alkyl substituted hydrazine derivative to that of phenylhydrazine may be explained as a confluence of two factors - the induction effect of the radical-substituent and the basicity of the substituted hydrazine. Figures 2; references 17: 11 Russian, 6 Western.

Description of Equilibria During Extraction of Uranyl Nitrates and Plutonium With 30 Percent Solutions of TBF in n-Paraffins Over Wide Interval of Concentrations and Tempertures

937M0174J St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 39-41

[Article by E. B. Renard, A. A. Chizhov, V. S. Vlasov, and A. M. Rozen; UDC 546.791.6+546.799.4]

[Abstract] The purpose of the present work is to provide a simple mathematical description of all known data on the distribution of uranium and plutonium in the PUREX process suitable for optimizing the treatment of spent nuclear fuel (including uranium-plutonium, i.e. systems with high concentrations of plutonium). Virtually all experimental data on the distribution of U(VI) and Pu(IV) aqueous nitrate solutions and 30 percent TBF (tributyl phosphate) in n-paraffins were processed. The data are presented as regressive relationships of distribution coefficients to component concentration. Accuracy is 8 percent. References 11: 5 Russian, 6 Western.

New Data on Extraction of Macro Quantities of Uranium and Plutonium From Aqueous Solutions of Nitric Acid With Tributyl Phosphate Solutions in n-Dodecane at Various Temperatures

937M0174K St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93

[Article by E. B. Renard, A. A. Chizhov, V. S. Vlasov, and M. P. Malafeyev; UDC 546.791.6+546.799.4]

[Abstract] The distribution of uranyl and plutonium nitrates and nitric acid in the PUREX process has been well studied and the results for systems employing 30 percent TBF (tributyl phosphate) solutions in paraffins have been presented. However, a gap remains in the published experimental data: missing are data on the distribution of uranium and plutonium in this system at higher temperatures. Interest in these data intensified following publication of a method for the joint extraction of uranium and plutonium at a higher temperature (55° C), combining the uranium and plutonium into the raffinate to 2 grams/liter and 20 mg/liter, respectively. This approach to the extraction of these metals may be used in the regeneration of spent nuclear fuel. In the present work a study was made of extraction equilibria in aqueous solutions of $(UO_2)(NO_3)_2$- $Pu(NO_3)_4$-HNO_3 in 20 and 30 percent TBF in n-dodecane at 25 and 60° C. The data were obtained in the stable region of a two phase system. The regions in the vicinity of the critical point were also studied (formation of a second organic phase at high plutonium nitrate concentration), as well as the behavior of protactinium in the system. References 6: 2 Russian, 4 Western.

Isoparaffinic Diluents in Extraction Technology for Regeneration of Fissionable Materials. Raising Technological Dependability and Nuclear Safety of Process

937M0174L St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 49-54

[Article by E. B. Renard, A. A. Chizhov, N. V. Neumoyev, and V. S. Vlasov; UDC 542.61:547.21]

[Abstract] The use of n-paraffin hydrocarbons as diluents for alkylphosphate extractants in operations involving solutions of spent nuclear fuel is encumbered by the separation into two layers of the metal-containing extracts upon reaching a certain (critical) concentration of metal (thorium, plutonium, strontium, etc.). These layers are not water-soluble and make the extraction process more difficult (possible disruption of the hydrodynamics of the process and raising the danger of a nuclear accident resulting from poor prognosis in the accumulation of highly concentrated fissionable material in the apparatus). Various methods are known for increasing the volume of the extractant such as raising the temperature, introducing aromatic compounds and alcohols, and using an isoparaffin as an extractant diluent. Known advantages of the latter include low freezing point, and low viscosity of products in aqueous solutions, as compared to normal paraffins. In the present work a study was made of dynamic viscosity and density of isoparaffin diluents of tributyl phosphate as functions of temperature. It was demonstrated that it is possible to raise the volume of the extractant in respect to plutonium. Empirical relationships are presented for computing maximum extractant volume (tributyl phosphate in isoparaffin solvents) as functions of mobility. Figure 1; references 4: 2 Russian, 2 Western.

Development and Structural Optimization of Technological Scheme for Treating Fast Neutron Reactor Fuel

937M0174M St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 55-58

[Article by E. B. Renard, A. A. Chizhov, V. S. Vlasov, M. A. Naumov, and M. P. Malafeyev; UDC 621.039.526]

[Abstract] The operation of fast neutron reactors and the associated accumulation of spent fuel presents several problems in the reprocessing of the fuel. Some of the main problems are the high activity of the working solutions, and the possibility of the formation of a second organic phase during extraction reprocessing due to the high concentrations of plutonium against a background of significant quantities of uranyl nitrate. A previously presented process is unique in that it combines uranium-plutonium extraction at a high temperature (55° C) and up to 2 grams/liter and 20 mg/liter, respectively, of uranium and plutonium throw off. Full saturation of the extractant and a high temperature provide high efficiency in separation from splintered elements. However, the process was presented as a

general plan only and a technological layout and working conditions are lacking. In the present work results are presented on the mathematical modeling of a single cycle scheme for extraction refining of spent nuclear fuel from fast neutron reactors with simultaneous extraction of uranium and plutonium at high temperature. An optimum configuration with stable operating conditions was found. The possibility of automating the process was demonstrated. Figure 1; references 5: 2 Russian, 3 Western.

Sorption-Selective Characteristics of Inorganic Sorbents and Ion Exchange Resins in Respect to Cesium and Strontium

937M0174N St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 76-82

[Article by V. V. Milyutin, V. M. Gelis, and R. A. Penzin; UDC 621.039.714]

[Abstract] The problem of deactivating liquid radioactive wastes formed during operation of nuclear reactors and refining spent fuel has become acute. Most of this waste is contained in effluents having medium to low levels of contamination. This problem became especially significant following the accident at Chernobyl and in connection with rehabilitation efforts at the "MAYAK" Production Association in Chelyabinskaya Oblast. Both sorption and ion exchange methods are used to treat natural and waste waters and much work has been published in this area. However, the results obtained by various authors are difficult to compare analytically because they were obtained under a variety of experimental conditions, and estimating the sorption-selective properties becomes qualitative or only semi-quantitative in character. Over the past several years the Physical Chemistry Institute has been conducting a systematic study on the sorption- selectivity properties of organic ion exchange resins in respect to cesium and strontium nucleides within the framework of a government program to liquidate the remains of the Chernobyl nuclear accident. In the present work the sorption-selectivity characteristics of natural and modified aluminum silicates, synthetic zeolites, phosphates, transition metal ferrocyanides, and carbonaceous materials were determined in respect to cesium and strontium ions. Coefficients of distribution for micro- quantities of strontium-85 and cesium-137 in sodium and calcium nitrate solutions under static conditions were determined. Treatment of Moscow River tap water contaminated with cesium and strontium was studied under dynamic conditions. It was demonstrated that the most effective sorbents against cesium are the ferrocyanide sorbents and natural aluminum silicates, while synthetic zeolites type A are most effective against strontium. References 17: 16 Russian, 1 Western.

Development and Study of High Activity ^{188}W-^{188}Re Generator

937M0174O St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 92-97

[Article by G. A. Brodskaya and O. U. Gapurova; UDC 541.15:546.7]

[Abstract] A ^{188}W-^{188}Re generator is based on the separation of rhenium-188 radionucleides from wolfram-188 formed by irradiation of wolfram-186. Basic problems in obtaining this generator are the accumulation of a parent wolfram-188 radionucleide having sufficient specific activity, dissolution of a wolfram target and conversion to an insoluble matrix by selection of a sorbent and sorbent form of wolfram, determining the sorption conditions, charging the generator column with radioactive wolfram, and elution of rhenium-188 with maximum bulk activity and high radionucleidic and chemical purity of the end radionucleide. In the present work a study was made of radiochemical fundamentals of this generator. Possibilities for accumulation of a parent radionucleide of wolfram-188 of high specific activity were determined. Optimum conditions were found for dissolution of wolfram targets from various materials (oxide, metal, acids) and converting them into a sorpable form. Rules governing the sorption of wolfram and rhenium on several sorbents were studied and the conditions for maximum and minimum sorption of both metals were determined. The conditions for charging generator columns with radioactive wolfram and the elution of highly active rhenium-188 were worked out. Aluminum oxide was used as sorbent and a sodium chloride salt solution was used as an eluent. Several series of generators with activities to 4 GBk were prepared and studied. Figures 4; references 9: 4 Russian, 5 Western.

Synthesis of SYNROC Type Ceramics From Melt

937M0174P St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 98-105

[Article by I. A. Sobolev, S. V. Stefanovskiy, and F. A. Lifanov; UDC 621.039.73

[Abstract] A basic way to increase the reliability of isolating radioactive wastes from the biosphere is through immobilization in chemically, thermally, and radiationally stable in materials having long time periods of stability. This requirement is met most nearly in synthetic mineral-like materials—analogs of natural rocks, which are known to remain stable over geological periods of time. In the 1970's a titanate ceramic called SYNROC (synthetic rock) was developed in Australia from perovskite, zirconolite, and chollandite minerals by hot pressing at 10^2-10^3 MPa pressures and 1200-1400° C temperatures. However, this method presents great technological difficulties from the standpoint of equipment design. A more convenient method to synthesize SYNROC is from the melt and the first modification, SYNROC-A was thus prepared. In the present work

other modifications, SYNROC-A, -B, -C, and -D were prepared in crucibles in a silicon carbide furnace and by induction melting in a cold crucible. The synthesized samples contained 10 and 15 percent by weight of oxides of liquid and solid radioactive wastes. Properties of the molten materials not containing the wastes are analogous to materials prepared by hot pressing. Introduction of an oxide of a medium-level radioactive waste material to SYNROC-B lowers its chemical stability. The effectiveness of preparing SYNROC type ceramics by induction melting in a cold crucible was demonstrated. Figures 3; references 18: 7 Russian, 11 Western.

Inclusion of Sodium-Containing Radioactive Wastes Into Loam Based Glasses

937M0174Q St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 106-113

[Article by S. V. Stefanovskiy, I. A. Ivanov, A. N. Gulin, and F. A. Lifanov; UDC 621.039.73]

[Abstract] From an economic standpoint, it is desirable to use low cost and readily available materials such as rock, industrial wastes, or fuel slag as matrices for localizing and immobilizing radioactive wastes. Glassification of sodium-containing radioactive wastes requires non-alkaline or low alkali rock and slags or other materials. Specifically, basalt, datolite, quartz sand, fluorite, clays, and loams have been proposed. The advantages of loam are mainly that it is readily available throughout the Russian platform, contains all required glass-forming components, especially silica and alumina, low concentrations of alkaline oxides, and a large amount of clay particles of less than 1 micron particle size, which facilitates making a uniform paste or slurry having thixotropic properties and being capable of long term storage in closed containers as well as transportation by pipeline under pressure over long distances. In the present work a study was made of glass formation in systems Na_2O (waste oxides)- Al_2O_3-Fe_2O_3- SiO_2, encompassing glass compositions obtained from radioactive wastes and loam. Relationships between viscosity, specific electrical resistance, and chemical stability as functions of glass composition in a radioactive waste oxide-loam pseudo-binary system were determined. Infrared spectroscopy and electron paramagnetic resonance indicated that at over 40 percent radioactive waste oxide content in the glasses, deep structural changes take place which are related to depolymerization of silicon-oxygen carcass manifested particularly as a marked increase in the leaching out rate sodium ions and cesium radionucleides. Figures 5; references 19: 15 Russian, 4 Western.

Comparitive Analysis of Water-Resistant Glass Compositions With Uniform Glass Matrices for Immobilization of Radioactive Wastes

937M0174R St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 120-124

[Article by O. K. Karlina, M. I. Ozhovan, and M. V. Popov; UDC 666.1:621.039.763]

[Abstract] The use of glass composition materials for immobilization of radioactive wastes has many advantages over uniform glass matrices. Glass composition materials consist of a glass matrix of a given composition in which the radioactive components are distributed as a dispersed phase. They are universal in waste composition and therefore using them makes it possible expand the class of treated wastes. Specifically, it is possible to immobilize in a glass matrix radioactive wastes containing insoluble compounds such as sulfates, molybdates, and oxides of heavy metals. Also, the technological process of radioactive waste immobilization presupposes a shorter high temperature action on the waste material than that of traditional methods of glassification. In the present work a comparative analysis was made between the two glasses. A maximum limiting value was determined for the particle size of the included radioactive phase in the glass composition and this value was found to be a function of the properties of the glass matrix and the coefficient of distribution of the radionucleide phase in the matrix. Figures 2; references 8: 6 Russian, 2 Western.

Isotope Exchange and Radiocarbon Method of Dating

937M0174S St. Petersburg RADIOKHIMIYA in Russian Vol 35, No 3, May-Jun 93 pp 139-141

[Article by A. A. Kist; UDC 541.15, 546.06.02, 621.039.86]

[Abstract] The radiocarbon method for dating archeological specimens of biological origin is based on measurement of the carbon-14 activity under the assumption that this nuclide stopped entering the organism during the time of its demise. Many other assumptions are also made. In the present work the possibility of a change in isotope composition in cotton and flax fabrics as a result of heterogeneous isotope exchange between the carbon dioxide of the atmosphere and that in the fabric. Labeled carbon dioxide is shown to be fixated strongly in the fabrics. It was concluded that changes in carbon isotope composition in archeological specimens are possible and that this factor must not be overlooked. References 2: 1 Russian, 1 Western.

Analytical Simulation of Dataflow-Controlled Computer

947K0046A Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 12, Dec 93 pp 165-178

[Article by O.M. Brekhov, V.A. Moraru, Moscow Aviation Engineering Institute; UDC 681.324:519.21]

[Abstract] A nontraditional dataflow computer architecture whereby the sequence of tasks in the dataflow-controlled computer (EVM UPD) is determined only by the readiness of the relevant data and if resources permit, jobs are executed concurrently and independently, is discussed, and an earlier study is expanded. An evaluation of the dataflow computer performance with changes in the multisequencing factor K in the neighborhood of unity calls for developing a probabilistic model with a random processor loading, i.e., given commensurate data processing durations in the storage blocks and processors. The dependence of the dataflow computer performance on the types of jobs being executed is considered and compared to the performance of a von Neumann series computer. An efficient recurrent procedure is developed for determining the steady-state dataflow computer model probabilities, making it possible to assess the computer performance as a function of the number of processors, storage blocks, their speed of response, work load parameters, throughput, and communication networks. An efficiency analysis demonstrates that as the number of processors increases to ten or higher, the dataflow computer performance is better than that of computer systems with traditional architecture. The specific boundary depends on the algorithmic and architectural parameters of the system under study. Figures 14; references 8: 5 Russian, 3 Western.

Use of Methods and Devices for Modelling in Science, Engineering and Economy

947K0027A Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 4, Jul 93-Aug 93 pp 85-89

[Article by V. F. Evdokimov, A. S. Ogir, Zh. P. Zhuravlev; UDC 534.8:534.7.4]

[Abstract] Discrete mathematical models of hologram descriptions are examined. They are based on phase dependencies of the Frenel integrated transform and use raster representations of holograms and objects in the form of unidimensional hologram projections of acoustic sections of objects. Raster representations allow two dimensional quasi holograms to be processed in a computer by using special unidimensional high-speed procedures, as well as coordinated filtration methods. Ways to form hologram descriptions in the Frenel zone are examined, which is fundamental for modelling acoustic holography problems. Figure 1; references 7.

Interference Suppressing Features of Discrete-Weight Addition of Space Separated Signals in Statistically Non-Uniform Channels

947K0010B Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian No 8, Aug 93 pp 36-38

[Article by V. A. Chernyavskaya, Odessa Electrotechnical Communications Institute; UDC 621.396.019.4]

[Abstract] The upper boundary of the average probability of error is obtained with discrete-weight addition of an arbitrary number of diverse signals, received in statistically non-uniform channels with Nikagami fading. It is demonstrated that in the presence of statistical heterogeneity in non-correlated diversity reception channels, and also when there is energy asymmetry, the discrete-weight addition is an effective method of signal processing, including a situation when majority addition is inefficient. This feature can be used as a criterion for selecting the engineering solutions when designing the addition devices. Figure 1; references 7: Russian

Application of Autocorrelation Processing in Estimating the Initial Periods of Random Pulsed Signals

947K0010A Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian No 8, Aug 93 pp 31-35

[Article by I. S. Nekrasov, V. N. Prokopov, Kursk Polytechnical Institute; UDC 621.391.82]

[Abstract] A system for autocorrelation processing of random pulsed signals is examined, and its fundamental probability characteristic is obtained. It is demonstrated that if some limited a priory information on the structure of random pulsed input signals is available, the estimates of their initial periods can be obtained by applying autocorrelation processing, while a high level of noise rejection of mutual interferences is provided. A block diagram of the system containing n parallel connected processing channels is provided, and the probabilities of correct determination of the channel number, probabilities of the signal transmission, and of false alarm were analyzed. The following conclusions were formulated: for a specified ratio f_{i+1}/f_i there exists an optimal threshold value K, where the probability P_i of correct determination of the channel number is maximum, and the probability $P_{\text{false alarm}}$ is minimum; with increased ratio f_{i+1}/f_i, when K is specified, the probability $P_{\text{false alarm}}$ is reduced; the increased ratio f_{i+1}/f_i may lower the threshold K, and as a consequence, increase P_i for a specified $P_{\text{false alarm}}$. Figures 3, references 2: Russian

Integral Equations of Three Dimensional Structure Electrodynamics and Iterative Techniques for their Resolution

947K0024A Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 8, Aug 93 pp 1345-1369

[Article by A. B. Samokhin; UDC 537.874.519.6]

[Abstract] Integral equations are examined, and the results of the study are given. These equations are used to describe diffraction of electromagnetic waves on three dimensional structures. A discussion of iterative techniques to solve integral equations is presented. References 55.

Electromagnetic Wave Scattering on Revolving Body With Multilayered Coating in Quasi-Optic Region

947K0024B Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 8, Aug 93 pp 1370-1378

[Article by S. G. Grishchenko; UDC 537.847.4]

[Abstract] Geometric optics is used to resolve electromagnetic wave scattering on an optically dense revolving body with a multilayered absorbing coating. The unknown scattering field is found by adding the rays re-reflected in the coating at the point of observation. A recurrent algorithm is developed for constructing a ray pattern of the field for a multilayered body, whose boundary is depicted by arbitrary smooth functions. In order to determine the accuracy of the solution, it is compared with the results of rigorous calculations and with experimental data for a sphere, round cylinder and oval body. Figures 5; references 10.

Reflection of Electromagnetic Waves From Inhomogeneous Absorbing Semiconductor Layer With Perfectly Conducting Screen

947K0024C Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 8, Aug 93 pp 1400-1407

[Article by I. B. Safonov; UDC 538.566:533.93]

[Abstract] The reflection of electromagnetic waves from an inhomogeneous semiconductor transfer layer with a perfectly conducting screen is examined. Using an analytical solution of the wave equation, an expression is obtained for the reflectivity of the electromagnetic waves, depending on the thickness of the layer, the width of the transition region, the concentration of electrons, the degree of absorption and the length of the irradiating wave. Figures 5; references 3.

Mathematical Modeling of Radiators Made of Ultrafine Conductors

947K0007A Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian No 7, Jul 93 pp 64-68

[Article by A. I. Samusenko, Gomel State University; UDC 621.396.677.45]

[Abstract] For simple shape radiators, the characteristics of antennas made of conductors with infinitely small radii ρ can be analyzed by applying approximate analytical expressions. Algorithms were developed, and cylindrical spirals (CS) over an infinite perfectly conducting screen were numerically examined applying a random shape ultrafine wire radiator analysis method. A comparison was also made of this method with the "Mei Integral Equations method". The computation results obtained by the two methods agree with accuracy of 1 - 2%. In order to estimate the boundary limits of this method, the functional dependance of the radiator's characteristic as a function of the conductor's radii was also made and the numerical results were compared with the analytical. A cylindrical spiral (CS) was examined with a number of turns N=6 and the winding angle λ=14°. It was demonstrated that when ρ was reduced from 10^{-2} λ to 10^{-5}λ, the input impedance Z_0 changed from (105-j33) Ohm to (511-j19) Ohm, and the directive gain from 11.5 to 2.5. Frequency relationships of the Z_0 and the directive gain for CS with $\rho=10^{-5}$ λ are shown in a graph. Figures 3, references 9: 6 Russian, 3 Western.

Measurement Results of Radio Wave Refraction Angle in Venus's Atmosphere using Bistatic Radar Data

947K0026A Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 8, Aug 93 pp 1379-1833

[Article by A. G. Pavelev, A. I. Kucheryavenko, S. G. Rubashkin, R. R. Salimzyanov, D. A. Pavelev; UDC 528.8]

[Abstract] Revised experimental data on the magnitude of the refraction angle and refraction attenuation of radio waves in Venus's atmosphere are presented using the results of bistatic radar measurements of the planet. In order to describe the refraction effects, a theoretical model is developed. This model is used to determine parameters which are necessary to calculate radio communication lines in the troposphere using refractive index versus height. The experimental data are compared with the results of calculations made using a theoretical model. Ratios which link the length of the phase path and integral absorption of radio waves in the atmosphere with parameters of the theoretical model are obtained. These ratios may be used to calculate communication routes in Venus's atmosphere. Figures 4; references 16.

Direct Solution for Determining Position of Radiation Source using Measurements of Differences in Distance and their Derivatives

947K0026B Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 8, Aug 93 pp 1435-1442

[Article by Yu. S. Rasshcheplyayev, V. A. Shcherbachev; UDC 621.391]

[Abstract]Algorithms are build to evaluate the location of a radiation source which is stationary relative to the surface of the Earth by using the results of combined measurements of differences in distance and their derivatives. Based on the least-squares technique, expressions are obtained for evaluating the coordinates of the source of radiation in the form of explicit functions of the initial measurements. Properties of the evaluations which are obtained and their precision characteristics are studied by using modelling. Figures 2; references 7.

Correcting Control Characteristic of Relaxation SQUID

947K0026C Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 8, Aug 93 pp 1526-1531

[Article by N. N. Budnik, Yu. D. Minov, V. N. Sosnitskiy, P. I. Sutkovoy; UDC 537.312.62]

[Abstract]A study of the characteristics of a relaxation SQUID magnetometer is performed. Two modifications are made to the base- line system of the SQUID by introducing an additional inductive coupling for the interferometer with power bus and a shunting circuit. The experimental results conformed to the theoretical analysis and showed the positive influence of these modifications in the form of an increased conversion coefficient, and a reduction in the effect of unstable power current and external interference. This reduces requirements established for the power circuits and for shielding the electronic components of the SQUID from

external magnetic interference for magnetometers operating under high interference and on an unstable power line. The proposed correction for the control characteristic of the relaxation SQUID may be used to improve precision and accuracy characteristics of SQUID magnetometers. Figures 5; references 10.

Stochastic Approach to Optimizing Modes of Nonlinear Stages of Aperiodic Power Amplifiers

947K0028A Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 4, Jul 93-Aug 93 pp 50-54

[Article by V. N. Kotlyarov, UDC 621.396.61: 621.375.026]

[Abstract] Methods for optimizing the energy parameters of nonlinear models of electronic power amplifiers with a nonresonant random load are discussed. These amplifiers are used to construct final stage broadband short-wave radio transmitters. The approach considered here may be used to calculate possible energy characteristics of various types of broadband power amplifiers with a prescribed load, for which the influence of harmonic components of the output signal spectrum must not be disregarded. Figures 2; references 5 .

Study of Hydrogen Sensitivity of ZnSe/GaAs Structures

947K00018F St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 6, Jun 93 Vol 27 pp 1060-1064

[Article by A. Yu. Mekekechko, A. V. Kovalenko, I. M. Chernenko, V. F. Katkov]

[Abstract]The study shows that a planar ZnSe/GaAs structure fulfills all the main requirements for semiconductor chemical sensors. Moreover, it is also possible to use this material as a gas detector. The fact that the stoichiometry is controllable when the layer structure is synthesized and the lack of defects in the crystal package reduce the effect of chemical activity of the working medium. In the broad range of partial hydrogen pressures, the ZnSe layer is characterized by a relative change in resistance of 5-50% with little sluggishness, fast recovery and a good reproducibility rate for the results. 2 figures, 5 references

On the Reasons for the Difference in Dose Dependencies of the Intensity of Different Luminescence Bands in $A^{III}B^{V}$ Semiconductor Compounds Irradiated by Fast Particles

947K0018E St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 6, Jun 93 Vol 27 pp 1030-1034

[Article by E. V. Vinnik, K. D. Glinchuk, V. I. Guroshev, A. V. Prokhorovich]

[Abstract]An analysis is performed to determine the reasons which lead to the difference in dose dependencies for the intensities of various luminescence bands in semiconductors. In other words, various luminescence bands have different (heightened or lowered) resistance to radiation exposure. It is shown that this difference might actually be due to more than the radiation stimulated change in the concentration of luminescence centers. Another factor may be the difference in the types of dependencies for the intensity of luminescence bands as a function of the intensity of luminescence excitation. The noted difference in dependencies must be taken into consideration when establishing radiation stimulated changes in the concentration of the luminescence centers from the dose dependencies of the intensity of the luminescence bands. 2 figures and 16 references.

Calculating Temperature Fields in GaAs Monocrystals Grown in a Thin Layer of Melt using the Kiropolous Method with Liquid Sealing

947K0018D St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 6, Jun 93 Vol 27 pp 1025-1029

[Article by G. P. Kovtun, A. I. Kravchenko, A. I. Zhukov, A. N. Sterlev, A. P Shcherban]

[Abstract]Computer modelling is used to compute temperature fields in GaAs monocrystals grown in a thin layer of melt by the Kiropolous method with liquid sealing. The results of the calculations are given. It is shown that by using a bottom heater, a side heater and an additional heater sunk in flux, the Kiropolous method can be used to crystallize a GaAs layer 0.5-1.0 mm thick in a large diameter crucible (80-130 mm) in temperature fields with low values for the vertical (6-8 K/cm) and radial (2-29 K-cm) components of the temperature gradient. 3 figures and 10 references.

Doping of Gas Epitaxial Layers by a Zn Acceptor Impurity under Liquid Epitaxy from Ga-Bi Melted Solutions

947K0018C St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 6, Jun 93 Vol 27 pp 1007-1113

[Article by Le Tuan, S. V. Novikov, I. G. Savelev, D. N. Shelkovnikov, Yu. V. Shmartsev]

[Abstract]A study is made of the processes which occur when GaAs layers are doped with a Zn acceptor impurity during liquid phase epitaxy from a Ga-Bi melted solution. The thickness of the GaAs : Zn or Bi epitaxial layers as a function of the melted solution composition is complex in nature. This is explained by the complicated form of the liquidus isotherm curves in the Ga-Bi- As system and the change in the mass transfer processes in the microinhomogenous liquid phase. The nature of the way atoms in the Zn mixture behave in epitaxial layers, in the substrates and in satellite substrates during the

growth processes is researched by using photoluminescence methods with layer-by-layer stripping. An explanation is given for the nonlinear relationship of the concentration of Zn in GaAs layers versus the content of Bi in the Ga-Bi solvent. This explanation is associated with the change in the vacancy concentration in the gallium sublattice and the nature of the Zn diffusional transfer in the liquid phase. The constant doping level in the epitaxial GaAs layer with the given solvent composition shows that the basic doping mechanism is the capture of Zn impurity atoms from the liquid phase during the growth process.

Numerical Computation of Non-Steady-State Characteristics in Vertical GaAs Field-Effect Phototransistors

947K0018B St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 6, Jun 93 Vol 27 pp 966-976

[Article by S. A. Abashkina, V. I. Korolkov, Ya. S. Rimshans, Yu. I. Skryl, T. S. Tabarov]

[Abstract] Numerical calculations are performed for the transient characteristics of vertical GaAs field-effect phototransistors with various levels of lighting and voltage values on the source and shutter, which creates a potential barrier for electrons. Photocurrent, potential energy distributions, and times to establish steady state and the gain in phototransistors with a concealed shutter for small light sources are calculated and the results presented. It is shown that for both a small barrier and a large barrier, the times for establishing steady photocurrent amount to several nanoseconds and depend on the voltage on the shutter. As voltage on the shutter is increased, speed increases. However, the photocurrent of the structure simultaneously decreases. A reduction in photocurrent at high voltages on the shutter causes a reduction in the properties of the structure. 5 figures, 1 chart and 21 references.

Surface Properties of *a*-Si : H Films

947K0018A St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 6, Jun 93 Vol 27 pp 913-916

[Article by A. M. Danishevskiy, V. Latinis, O. I. Konkov, E. I. Terukov, M. M. Mezdrogina, M. S. Chusovitin; UDC 621.315.592]

[Abstract] The surface properties and pulse luminescence spectra of relatively thick *a*-Si : H films (approximately 1 micrometer) are researched. It is shown that the porous structure on the surface of the films leads to the appearance of a wide band of shortwave luminescence and a drop in shortwave photoconductivity. It is shown that there is no strip of luminescence in homogenous films (without columns) which have ultraviolent photoconductivity. 3 graphs and 5 references.

On Several Distinctions When Designing Filters With Waveguide Propagation of Surface Acoustic Waves

947K0023A Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 8, Aug 93 pp 1411-1416

[Article by S. A. Orlov; UDC 621.534.8]

[Abstract] Simple mathematical models of microwaveguides are proposed. These microwaveguides are based on scalar isotropic approximation. A numerical algorithm for calculating the transfer characteristics of devices with a waveguide transmission line is developed. In order to reduce the influence of solid waves, a uniform directional coupler is proposed for use. The amplitude-frequency characteristics of a filter containing two aperture apodized interdigital transducers joined by a directional coupler are measured and the results given. The topology of the devices is also analyzed. It is shown that the mathematical model which is used for the waveguide is adequate for the results of the experimental research. Moreover, the technical characteristics of the devices exceed traditional analogs. Figures 5; references 7.

AVIATION AND SPACE TECHNOLOGY

Aerodynamic Characteristics Analysis of Frame Grid Fin Assembly in Subsonic Flow

947F0039A Moscow VESTNIK MOSKOVSKOGO GOSUDARSTVENNOGO TEKHNICHESKOGO UNIVERSITETA: SERIYA MASHINOSTROYENIYE in Russian No 2(11), Apr-Jun 93 pp 73-86

[Article by A.I. Pastukhov, V.F. Veretennikov, R.I. Mendubayev; UDC 533.6.013.13]

[Abstract] The popularity of lifting, stabilizing, and control surfaces executed as grid wings and a scarcity of aerodynamic analyses of numerous wing shapes necessitated the development of an aerodynamic analysis method which would make it possible in the nonlinear problem formulation to determine the aerodynamic characteristics of the planforms, side frames, wings, and fin assemblies within a broad range of geometric parameters of grid wings and select optimum grid wing configurations from the aerodynamic characteristics viewpoint. An algorithm for determining the aerodynamic characteristics based on a vortical model is proposed, and an approximate method of analyzing the aerodynamic characteristics (ADKh) of frame grid wings and the frame fin assembly as a whole is developed. A comparison of analytical data to the experimental results makes it possible to speculate that the procedure proposed for analyzing the aerodynamic characteristics of frame grid fin assemblies, rectangular slip plates, and slender wings is adequate for practical applications and may be recommended for implementation in aircraft ship, and vessel computer-aided design systems (SAPR). Figures 10; references 6: 5 Russian, 1 Western.

Subsonic Radiative Waves

947F0036E Moscow IZVESTIYA ROSSIYSKOY AKADEMII NAUK: MEKHANIKA ZHIDKOSTI I GAZA in Russian No 5, Sep-Oct 93 pp 166-183

[Article by T.V. Loseva, I.V. Nemchinov, Moscow; UDC 533.72:535.233]

[Abstract] The principal problem arising in the study of subsonic radiative wave propagation under the effect of laser radiation, i.e., finding the mechanisms of its propagation, measuring its velocity, and establishing the wave structure, is addressed on the basis of numerous published sources. In particular, a steady-state model with nonequilibrium radiation, numerical calculations of the problem of plane subsonic radiative wave propagation, steady-state model of an ultraviolet laser-supported subsonic radiative wave, the dependence of the subsonic ultraviolet laser-supported radiative wave parameters on the radiation flux, two-dimensional subsonic radiative waves, the quasi-steady subsonic radiative wave propagation conditions, the effect of the irradiation spot radius, the effect of the radiation nonuniformity, and the effect of the thin reduced-density channel are considered in detail. The conclusion is drawn that such laser pulse parameters as the pulse duration, power, and wavelength and the properties of the gaseous medium surrounding the obstacle are the determining factors in the laser-supported radiative wave propagation. The analysis is based on the analogy between the propagation of optical discharges and combustion and detonation of flammable substances. Figures 7; tables 2; references 45: 44 Russian, 1 Western.

On Hypersonic Flow Structure in Large-Scale Multidiaphragmic Shock Tube

947F0036D Moscow IZVESTIYA ROSSIYSKOY AKADEMII NAUK: MEKHANIKA ZHIDKOSTI I GAZA in Russian No 5, Sep-Oct 93 pp 158-165

[Article by N.A. Anfimov, I.V. Yershov, Ye.I. Ruzavin, S.S. Semenov, S.K. Shimarev, Moscow; UDC 533.6.071.8]

[Abstract] The urgency of studying shock tubes for simulating hypersonic flows and examining aerophysical processes which accompany the movement of flying vehicles and meteorite bodies in the earth's and other planets' atmosphere, particularly large-scale shock tubes capable of obtaining extended quasistatic high-temperature gas flows whose duration is sufficient for taking various measurements on models of winged vehicles, prompted an investigation into hypersonic flows in such tubes with multiple diaphragms. In particular, the flow structure in such tubes at various operating conditions and regimes is examined; in so doing, the shape and structure of the shock wave front are determined, the quality and duration of working flows are evaluated, and the shock wave parameters are measured in order to use large-scale shock tubes in hypersonic aerodynamic and aerophysical research. In addition, the shock wave interaction with various models, e.g., spacecraft and aircraft, their components and modular configurations, terrestrial structure elements, etc., is also studied using the installation. The study made it possible to obtain data on the fundamental physical and chemical properties of air at high temperatures and pressures. The installation developed by the Central Scientific Research Institute of Mechanical Engineering has a channel with a 0.5 m diameter, a close to 200 m length, and a gas holder with a 3 m diameter and 23 m length. The findings have been implemented in the development of such delivery vehicles as Vostok and Proton, Soyuz reentry modules, Luna, Venera, and Mars descent modules, and Energiya-Buran complex. Figures 4; tables 1; references 14: 11 Russian, 3 Western.

NUCLEAR AND NON-NUCLEAR ENERGY

Welding of Nuclear Reactor Core Elements

947F0037A Moscow SVAROCHNOYE PROIZVODSTVO in Russian No 9(707), Sep 93 pp 11-14

[Article by V.A. Vinogradov, L.N. Shchavelev, V.S. Popenko, V.A. Seryeznov, NIKIMT Scientific Production Association; UDC 621.791.754'29:621.039.6]

[Abstract] The thirty-year experience with developing the equipment and practices for welding nuclear reactor core components, radioactive isotope modules for various purposes, and other nuclear industry products accumulated at the NIKIMT Scientific Production Association is reviewed. Attention is focused on achievements in the field of argon arc welding of fuel elements (TVEL), magnetic field-controlled arc welding (DUMP-process), and electron beam welding. In particular, the SA-477, SA 457, SA-466, and SA-450 argon arc welding machines, SA-448 elevated pressure argon-helium arc welding machine, and SA-330, SA-340, SA-413, and SA-451 electron beam welding machines are described in detail. Today, the association is supplying the industry with small batches of power supply plants for 6 kW welding machines with a 75 kV accelerating voltage. This broad range of equipment and methods makes it possible to weld virtually all core elements of domestically made reactors. Some of the original units which have been proposed and implemented in the nuclear industry are suitable for use in various branches of the national economy. Figures 9.

Comprehensive Support for Pipe Welding Operations in Clean Rooms

947F0037B Moscow SVAROCHNOYE PROIZVODSTVO in Russian No 9(707), Sep 93 pp 24-25

[Article by V.A. Bukarov, Yu.S. Sedov, Yu.S. Ishchenko, NIKIMT Scientific Production Association; UDC 621.791.754:621.643.1/.2]

[Abstract] The stringent requirements imposed on the toxic substance concentration in process media transported mostly over electrochemically polished stainless steel pipes which are usually fabricated by gas-shielded nonconsumable electrode welding prompted the development of comprehensive support for pipe welding in clean rooms. The equipment and machine tool attachments necessary for ensuring the requisite welded joint quality from the viewpoint of protecting the weld metal and heat affected area (ZTV) from oxidation are outlined in detail. The Kama-1 pipe welding head developed, manufactured, and tested by the NIKIMT Scientific Production Association for welding small diameter pipes (5-14 mm) and its successor—the Kama-2 head—are described and their specifications are cited. Equipment for the ER-273 power supply unit for single- and multiple-pass wedding, a TV endoscope, ODA welding head attachments, and a manual pipe cutter developed by the association are described and their technical data are summarized. All above equipment can be stored in a specially designed transportable case. Figures 6; tables 2.

Realization of Unification Principles in Developing Arc Welding Equipment for Erection Practices

947F0037C Moscow SVAROCHNOYE PROIZVODSTVO in Russian No 9(707), Sep 93 pp 26-28

[Article by V.A. Khavanov, Yu.S. Sedov, S.I. Poloskov, NIKIMT Scientific Production Association; UDC 621.791.75.03-52]

[Abstract] A combination of stringent requirements imposed on the welded joint quality, a wide range of welded materials and product types, and diverse welding condition in erection practices necessitated optimization of the types of semiautomatic welding machines and their unification. To this end, the association carried out a systemic analysis of domestic and foreign semiautomatic welding machines and a structural analysis of their principal functional systems. The study revealed that today's industry needs could be met by four types of semiautomatic welding machines for steel and aluminum sheet joints (using wires). A modified design of pipe welding heads on the basis of the ODA 46-72 base prototype, the SA-616 pipe welding head, the SA-577 automatic welding machine for welding pipes into tube plates, the Kama-1 chamber head for the SA-621 machine, and the self-propelled SA-615 welding head designed on the basis of modular components are described in detail. All designs employ the building block principle with the following components: welding wire feed mechanism for all standard sizes; three types of control equipment; and five types of wedding heads with four types of welding wire with a single central brake; in addition, replaceable and fast wearing parts, e.g., feed rollers, guides, current leads, etc., are also unified in the mechanisms and burners. It is noted that the possibilities of unifications have not been fully exhausted. Figures 5.

Nondestructive Testing Development: Experience and Outlook

947F0037D Moscow SVAROCHNOYE PROIZVODSTVO in Russian No 9(707), Sep 93 pp 29-31

[Article by V.I. Konstantinopolskiy, M.V. Grigoryev, V.V. Grebennikov, I.M. Fateyev, NIKIMT Scientific Production Association; UDC 621.791.05:620.179]

[Abstract] The association's achievements in the field of nondestructive testing, particularly the development of a broad range of both traditional and special-purpose

skill-intensive processes, procedures, and facilities on the basis of radiation, acoustic, eddy current, magnetic, optical, and other types of inspection are reviewed, and it is noted that several institute departments are engaged in addressing other testing issues. A number of designs in the field of nondestructive testing realized on the basis of the institute's own unique developments is summarized. Attention is focused on developing methods and facilities for ultrasonic testing of austenite welds and procedures which would make it possible to classify the detected flaws. In recent years, more than 30 types of reactor vessel and primary circuit testing equipment have been developed by the institute. It is noted that the institute's work in this field is characterized by its comprehensive approach to solving problems. The outlook for further development in the field of nondestructive testing is discussed. Figures 7; references 3.

Remote Controlled Welding Equipment for Routine Maintenance and Repairs in Nuclear Industry

947F0037E Moscow SVAROCHNOYE PROIZVODSTVO in Russian No 9(707), Sep 93 pp 31-33

[Article by V.A. Khavanov, Yu.S. Sedov, NIKIMT Scientific Production Association; UDC 621.791:620.9:62-519]

[Abstract] The specific features of nuclear power industry installations and the resulting requirements imposed on the welding practices, structures, and operating rules, particularly the harmful impact of the installation environment on the operating personnel and equipment, prompted the development of remote controlled welding facilities and processes which are more stable and informative. For illustration, the SA-296 automatic welding machine for gas-shielded consumable and nonconsumable electrode welding of annular butt joints is considered and its components are outlined. A family of welding machines developed on the basis of these components is described. The design of the automatic welding arc length control device (ARND) which is crucial for use in the nuclear industry is discussed. An analysis of the welding process and equipment requirements for routine maintenance and repair operations in nuclear power plants and the development and operating experience accumulated in this field make it possible to recommend that emphasis be placed on raising the automation level by using welding adaptation systems. Figures 3.

Certain Issues of Stabilizing Peat Brick Plant Operation

947F0043B Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY I ENERGETICHESKIKH OBYEDINENIY SNG: ENERGETIKA in Russian No 7-8, Jul-Aug 93 pp 100-103

[Article by B.A. Gogatov, N.I. Berezovskiy, Belarussian State Polytechnic Academy; UDC 662.812]

[Abstract] The need to take into account random factors in order to control the peat brick plant dryer operation more effectively prompted the development of a computer simulation technique for analyzing the material balance of the peat brick plant. The model makes it possible to establish the effect of the raw material moisture and ash content variance on the specific peat rate per ton of bricks and identify reserves for saving milling peat. The study also shows that the peat brick plant output can be stabilized by computer-based automation of the dryer operation. The formulae for computing the material balance are derived. The effect of the raw material moisture and ash content on the specific milling peat consumption and the peat moisture content behavior in the Peko dryer are plotted. The raw material, steam, and air consumption in the Peko dryer is summarized. The control algorithm developed for the computer and the devices which control the screw rotation speed and the gate and fan position on the basis of the computer analysis and a DZ-28 microcomputer-based unit used for stabilizing the dryer operation are described. The use of computer simulation makes it possible to lower the peat consumption and increase the plant output while computer-based dryer control improves the product quality, lowers the specific power consumption, and increases the labor productivity. Publication of the article is approved by the editorial board for consideration and implementation in the industry. Figures 3; tables 1.

On Utilizing Waste Heat Recovery Gas Turbine Plants and Steam Gas Plants in Belarussian Power Industry

947F0043A Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY I ENERGETICHESKIKH OBYEDINENIY SNG: ENERGETIKA in Russian No 7-8, Jul-Aug 93 pp 43-45

[Article by V.V. Gerasimov, A.D. Kachan, Belarus Republic Power Industry Ministry and Belarussian State Polytechnic Academy; UDC 621.438.313]

[Abstract] An acute shortage of installed capacity coupled with the obsolescence and wear of thermal power plant equipment as well as a sharp rise in energy prices and increasing reliance on Russian natural gas prompted the Belarussian power industry to search for ways of increasing the utilization efficiency of gas by using waste heat recovery gas turbine plants (UGTU) and binary steam gas plants. The factors which affect possible fuel savings and the criteria for correct selection of the type of power plants are outlined. A formula for calculating the equivalent fuel economy is derived. An analysis shows that the greatest fuel economy can be achieved by using extraction (heat supply) gas turbine plants (GTU) and steam gas plants and that fuel savings can be increased further by using binary extraction gas turbine plants with backpressure turbines. The urgency of implementing low-power extraction turbine-based gas turbine and steam gas plants is stressed, and it is noted that such low-power plants can be brought on stream much faster than powerful plants. References 3.

MECHANICS OF GASES, LIQUIDS, AND SOLIDS

Practical Aspects of Welding Pipelines for Transporting Superpure Gases in Electronics Engineering Industry

947F0038A Moscow SVAROCHNOYE PROIZVODSTVO in Russian No 9(707), Sep 93 pp 21-22

[Article by Yu.S. Ishchenko, A.D. Gaydukov, V.A. Doronin, NIKIMT Scientific Production Association; UDC 621.791:621.643.1/.2]

[Abstract] The effect of the purity of gases transported over various types of pipelines with welded joints on the "memory" of modern electronic devices, the scarcity of detailed data on the extent to which the welding practices and welds serve as sources of trace amounts of impurities, and the lack of relevant regulatory documents governing the design and process parameters prompted a reevaluation of the practical aspects of wedding on pipelines intended for carrying superpurified gases in the electronics industry. The appearance of superfine residue on the welded pipe surface with particles $\leq$0.5-1 μm in size and changes in the weld and heat affected area (OShZ) surface composition, e.g., the appearance of nonmetallic inclusions, are discussed, and certain factors which determine the weld and heat affected area protection inside the pipe are described in detail. The effect of the shielding gas purging duration which ensures a twentyfold replacement of the gas atmosphere as a function of the flow velocity (in order to eliminate the fine deposit), the weld and heat affected area surface quality as a function of the plate surface preparation on the fusing side, and the effect of the welding conditions and inner surface state on the weld surface roughness are summarized. The findings demonstrate that the weld is the principal source of elevated impurity desorption which can be lowered by taking into account the effect of the welding method and conditions on the weld surface roughness, shielding gas rate, and protective device design on the development of nonmetallic inclusions, evaporation products, and changes in the phase composition of the heat affected area surface. Tables 3; references 8: 7 Russian, 1 Western.

Evaluation of Fractal Dimension of Self-Affine Sets: Method for Counterscaling of Dispersions

947N0006A Moscow DOKLADY AKADEMII NAUK in Russian Vol 332 No 1, Sep 93 pp 89-92

[Article by S. S. Ivanov, Oceanology Institute imeni P. P. Shirshov, Russian Academy of Sciences, Moscow; UDC 550]

[Abstract] It was demonstrated earlier that ordinary fractal geometry methods are inapplicable for research on many natural processes and objects and therefore the concept of self-affine sets was introduced. These self-affine sets are characterized by two different fractal dimensions, local and global (both these values coincide in the case of ordinary self-similarity). Many unsuccessful attempts have been made to develop an adequate and convenient method for evaluating the fractal properties of such sets, but a number of difficulties were encountered. A new method is therefore proposed for evaluating the scale invariance of self-affine sets which is based on investigation of the scale properties of mean values and dispersions. The method is explained in detail. Examples are cited from different branches of the earth sciences (field of specific intensity of seismic process, relief of surface of solid Earth, sequence of geomagnetic field reversals during the last 160 million years) showing that self-similarity is characteristic of the most diverse natural processes and that the proposed method makes possible reliable evaluation of their fractal dimensions. In cases when counterscaling reveals considerable asymmetry, as in the case of regional relief, it is possible to speak of a more complex structure of the set than simple self-similarity in which the fractal characteristics, determined "from inside" and "from outside" the set, differ significantly. In such a situation the determined fractal dimensions can be identified with local and global self-affine sets respectively. Figures 3; references: 5 Russian, 6 Western.

Hydrogeological Effects of Underground Nuclear Explosions

947N0008A Moscow DOKLADY AKADEMII NAUK in Russian Vol 332 No 3, Sep 93 pp 372-374

[Article by V. V. Adushkin, A. A. Spivak, E. M. Gorbunova and Ye. N. Ferapontova, Dynamics of Geospheres Institute, Russian Academy of Sciences, Moscow; UDC 553.7+550.34]

[Abstract] Research on the reaction of ground water to disturbances caused by underground nuclear explosions was carried out during the period 1983-1989 using data from 96 observation holes in the Semipalatinsk test range at distances 0.3-10 km from the epicenter. The observations were made at the time of 44 underground nuclear explosions (29 in deep holes and 15 in drifts) with a TNT equivalent from 6 to 150 kilotons. A change in hydrogeological conditions was caused by a change in the mechanical state of the rocks. The greatest change in water conductivity was observed in the neighborhood of holes containing the least water. In holes penetrating andesitic porphyries there was an average increase in water conductivity from 0.26 to 0.52 m^2/day, corresponding to an increase in total rock porosity from 3.8 to 5.3%. An underground nuclear explosion results in disruption of natural hydrogeological conditions in a region with a relative radius $r/q^{1/3}$ to 1000 $m/kt^{1/3}$, which is greater by an order of magnitude than the radius of the zone of fracturing induced during an explosion and which corresponds to the zone of irreversible local disruptions of the medium. Changes in hydrogeological conditions were caused by: an increase in the effective pressure of the fluid in water-bearing rocks; a change in the mechanical, and therefore, the filtration properties of reservoir rocks; formation of new filtration channels; formation of underground voids as a result of an explosion and their subsequent filling with ground water. Figures 3; references 7: 5 Russian, 2 Western.

Concerning Short-Term Precursors of Earthquakes

947N0005A Moscow FIZIKA ZEMLI in Russian No 9, Sep 1993 pp 67- 70

[Article by S. I. Zubkov, Institute of Geophysics imeni O. Yu. Schmidt of the Russian Academy of Sciences; submitted 24 Oct 92; UDC 550.34.013.2]

[Abstract] Short-term precursors of earthquakes were defined as variations in a geophysical field that satisfy three primary conditions for the amplitude of the variation (it must exceed a precursor threshold equal to two standard deviations of the quantity in question during periods of seismic calm), the time interval prior to a particular seismic event (hours and days), and the distance from where the precursor was measured to the epicenter of the earthquake (epsilon^M kilometers, where M equals magnitude). Each of these components of the definition was elaborated individually. This definition was then used as a basis for performing a statistical analysis of a wide variety of short-term precursors recorded at a number of observation stations over a large area around the epicenters prior to the Tanshan*** and Haichen*** earthquakes in China. The quantitative analysis of this data point to a definite correlation between the short-term precursors of an earthquake and the formation of its seismic focus. According to all the data available for this particular study, the value for the correlation between the time frame and amplitude of short-term precursors, on the one hand, and the distance of these precursors from an earthquake's epicenter and the magnitude of that particular earthquake, on the other, lies between 0.57 and 0.84, with an average value of 0.70. It was concluded that the statistical correlation between short-term anomalies in a geophysical field and specific earthquake parameters indicate that these anomalies are indeed precursors of actual earthquakes and that they should be used to forecast the time frame within which a particular seismic event is expected to occur. Figures 1; references 17: 16 Russian, 1 Western.

On the Approximation of the Effective Speed of Sound in the Acoustics of Moving Media

Moscow IZVESTIYA AKADEMII NAUK FIZIKA ATMOSFERY I OKEANA in Russian Vol 29, No 2, Apr 93 pp 194-201

[Article by O. A. Godin, D. Yu. Mikhin, and S. Ya. Molchanov, Russian Academy of Sciences, Institute of Oceanology]

[Abstract] The author investigates the applicability of the widely used approximation method for the description of acoustic fields in moving media, which is commonly applied to the measurement of ocean sound fields. The method, which is based on Rayleigh's "Theory of Sound," consists in replacing the the actual moving medium with some immobile one, which has the effective speed of sound, dependent on the speed of the current.

Analytical estimates were made of the error in determining the phases and amplitudes of the rays arriving at the point of observation. The validity of the estimates was confirmed by simple models of the medium, with exponential laws on the variation of the speed of the current and of the velocity of sound, which made possible an accurate computation of the path of the rays and eikonals. The validity of the estimates was also confirmed by means of numerical modelling.

It was demonstrated that the main component of error in calculating the level of sound pressure under conditions of multiple rays is the error in the determination of the phase of the field at the rays, and that this error increases with distance. This knowledge made it possible to construct formulae expressing the error, and thereby provided a simple method for estimating the applicabiity of the approximation method in calculating the intensity of an acoustic field. In conjunction with these formulae the approximation method can be used successfully.

The Transmission Functions of Viewing Systems Through a Rough Sea Surface

937NO094B Moscow IZVESTIYA AKADEMII NAUK FIZIKA ATMOSFERY I OKEANA in Russian Vol 29, No 2, Apr 93 pp 222-228

[Article by V. L. Veber, Russian Academy of Sciences, Institute of Applied Physics, Nizhnyy Novgorod]

[Abstract] A theoretical analysis was made of the effect of wind waves on the point scattering function of viewing systems used in the observation of undersea objects. The author points out initially that, while in the case of diffused illumination from a fairly wide light source the optical transmission function can be described as a Gauss function, in the presence of directed illumination from a single light source, such as the sun, the Gauss function no longer applies, and determining the optical transmission function becomes extremely difficult. In this case an analysis of the point scattering function is more useful.

Through a series of formulae the author determines the integral paramemeters of the point scattering function under conditions of a rough sea surface illuminated by direct sunlight.

The author concludes that distortions of the point scattering function are mainly caused by the effects of the cross-correlation of light radiation falling on the sea surface and of that coming from beneath it, and are specific for the conditions of directed illumination. At the same time the degree of distortion is dependent on a number of factors, chief of which are the angle between the direction of illumination and that of observation, the depth of the undersea object under observation, and the roughness of the waves, which is determined by surface wind velocity.

Gyroscopic Waves in a Continuously Stratified Ocean

937NO094C Moscow IZVESTIYA AKADEMII NAUK FIZIKA ATMOSFERY I OKEANA in Russian Vol 29, No 2, Apr 93 pp 229-236

[Article by S. F. Dotsenko, Academy of Sciences of the Ukraine, Marine Hydrophysical Institute]

[Abstract] The author makes an anlaysis of free and forced gyroscopic (inertial) waves in a continuously stratified ocean of constant depth, using f-plane approximation.

The vertical structure of the waves is examined, and through a series of formulae the long- and short-wave approximations of their dispersive dependencies are obtained. A study is also made of Airy wave packets, which are generated during the evolution of initial disturbances in the ocean. The special features of the generation of gyrsoscopic waves by periodic and by moving disturbances are described, and a comparison is made of the effectiveness of wave generation by surface and by bottom disturbances.

On the basis of his investigation the author concludes that gyroscopic waves possess properties which differentiate them substantially from internal waves. The main differences lie in the frequency range of their occurrence, in their vertical structure, in the directions of their propagation in relation to the generating sources, and in the spatial structure of fields of gyroscopic waves behind moving disturbances. Effective generation of gyroscopic waves can be expected in layers of quasi-homogeneous depth during the flow of currents past irregularities in the terrain of the ocean floor. The question of experimental detection of gyroscopic waves in the world ocean remains still to be explored.

The Manifestations of Solitons Characteristics in Internal Waves on the Shelf

937NO094D Moscow IZVESTIYA AKADEMII NAUK FIZIKA ATMOSFERY I OKEANA in Russian Vol 29, No 2, Apr 93 pp 244-252

[Article by A. N. Serebryanin, Acoustics Institute Imeni Academician N. N. Andreyev]

[Abstract] Measurements of intense internal waves were conducted over several years by temperature sensors with spaced antennae distributed over the shelf zones of the Caspian Sea and the Sea of Japan.

The author's examination of the measurements showed that the discrepancy between the dispersive relationship of linear internal waves of the first mode and the parameters of measured waves is connected with the non-linearity of the latter. The waves which were observed showed features which were evidence of their soliton nature, such as, for example, their greater speed as compared to linear waves, and the dependence of their speed on amplitude. Some typical manifestations of soliton manifestations in internal waves in the shelf zones were multi-stage tidal bores and precursor waves.

The author concludes that the most reliable means of identifying solitons in on-the-scene oceanological investigations is by means of qualitative concurrence. As regards a quantitative comparison with the equation of Cortevega de Brisa, there does not appear to be full concurrence in all parameters, although in some cases the agreement seems to be very close. This can be explained by the numerous factors which are not considered in the equation, such as the current, the proximity of the bottom, etc. Nonetheless the properties of solitons in shelf zones are sufficiently pronounced so that they cannot be obscured by external environmental factors and the variability of these factors.

A Statistical Model of Survey Monitoring of the Spotnees of Ocean Fields Based on the Example of an Ocean Temperature Field

937NO094E Moscow IZVESTIYA AKADEMII NAUK FIZIKA ATMOSFERY I OKEANA in Russian Vol 29, No 2, Apr 93 pp 265-271

[Article by A. K. Ambrosimov, Russian Academy of Sciences, Institute of Oceanology]

[Abstract] On the basis of a wide range of of data the author constructs a stochastic classification model for the characteristics of the empirical distributions of fields of various types. As experimental material he uses 15 samples from surveys of ocean temperature fields obtained on expeditions by research ships of the Academy of Sciences of the USSR in various dynamic zones of the Atlantic Ocean and the Mediterranean.

By means of the criterion X^2 algorithms were constructed for the optimal classification of empirical histograms according to general populations. Using the results of the measurements an analysis was made of the general populations of horizontal l^* scales for temperature fields in the upper layer of the ocean.

Internal Waves in the Vicinity of an Intrusive Lens

937NO094F Moscow IZVESTIYA AKADEMII NAUK FIZIKA ATMOSFERY I OKEANA Vol 29, No 2, Apr 93 pp 272-280

[Article by K. V. Konyayev, E. A. Leont'yeva, and E. G. Morozov, Acoustics Institute]

[Abstract] On the basis of data relating to currents obtained in the Mesopolygon experiment, which was conducted in the tropical part of the North Atlantic in 1985, the authors made a statistical examination of an internal wave field, with particular emphasis on inertial and tidal waves.

It was found that the chief anomalous features of inertial and tidal waves were their increased intensity, and that the intensity depends on the depth of the horizon, as well as on frequency and time. At the same time the intensity of the waves decreased considerably towards the ocean's surface.

Conclusions which could be drawn from the above were first that inertial and tidal waves are generated locally in the lower levels of the ocean, and secondly that on the average they lose their energy as they rise towards the surface.

On the basis of similarities between some of the data obtained in the Mesopolygon experiment and data obtained in other regions, the authors speculate that the generation of inertial and tidal waves in this area may be caused by an intrusive lens of Mediterranean waters.

On the Vertical Structure of Tidal Internal Waves in the Ocean

937NO094G Moscow IZVESTIYA AKADEMII NAUK FIZIKA ATMOSFERY I OKEANA in Russian Vol 29, No 2, Apr 93 pp 283-285

[Article by V. V. Novotryasov, Pacific Ocean Oceanological Institute of the Russian Academy of Sciences, Far Eastern Department]

[Abstract] The author points out initially that, although some researchers believe that tidal internal gravitational waves in the ocean possess a modal structure, others are of the opinion that the formation of a field of vertically standing internal gravitational waves in such a variable medium as the ocean would probably not occur. Using data from soundings carried out by a drifting scientific research ship, the author attempts to determine the amplitude functions of the individual modes of tidal internal gravtitational waves by means of an analysis of vertical temperature soundings.

Soundings, which were carried out in the region of 9°10' North latitude and 176°06' West longitude, were at 30-minute intervals and reached a depth of 600 m. For an analysis of the profiles of the vertical soundings the method of empirical orthogonasl functions was used.

The conclusions which could be drawn from the results of the soundings were as follows:

1. In the part of the ocean which was examined the average state of a random field of internal gravitational waves on tidal frequency can be represented in the form of a superposition of vertically standing internal waves.

2. In the open ocean the mechanism for the generation of tidal internal waves with a modal structure may be the parametric instability which is produced by tide-forming forces.

Models of Vertical Distribution of Tropospheric Ozone and Atmospheric Circulation

937N0110A Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No 6, Jun 93 pp 51-56

[Article by V. I. Bekoryukov and A. A. Kukoleva, Central Aerological Observatory; UDC (551.510.534: 551.510.52).001.572+551.513]

[Abstract] Empirical models of the vertical distribution of ozone in the altitude range 10-32 km have been published, but data on tropospheric ozone are lacking and data from the existing ozonometric network are inadequate for constructing zonal, global or regional models. However, data from the world ozonometric network were used in constructing models of the partial pressure of ozone in the troposphere for 35 stations. The data taken into account included the mean climatic distribution of the wind, climatic characteristics of the tropopause and location of the principal jet stream zones over the northern hemisphere. The seasonal variation of ozone partial pressure was determined for the 300- and 500-gpa surfaces for different points in the hemisphere. These data revealed that the classical seasonal variation of tropospheric ozone density with a summer maximum and a winter minimum is not always observed. The constructed models of the vertical distribution for these stations show that the accepted seasonal variation of ozone density occurs only in regions not subject to the influence of jet streams. In the latter, however, the ozone maximum, as in the lower stratosphere, is in the spring. It can be postulated that under definite synoptic conditions a considerable quantity of ozone is pumped into the troposphere from the stratosphere. Figures 3; references: 6 Russian.

Diagnostics of Ozone Anomalies in Northern Hemisphere

937N0110B Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No 6, Jun 93 pp 57-61

[Article by Ye. A. Zhadin and N. D. Petushkov, Central Aerological Observatory; UDC 551.510.534(215-17)]

[Abstract] The reasons for the appearance of ozone miniholes over the northern hemisphere in January 1986 and 1987 are discussed. This phenomenon is usually observed in the period October-March, its appearance has an irregular character and may vary from year to year. These miniholes occur in the northern hemisphere middle and high latitudes when there is no global ozone hole in the Arctic. An attempt is made to establish correlations between changes in wave activity in the lower stratosphere and ozone distribution anomalies in the northern hemisphere high latitudes. The many processes involved in the development of these miniholes are analyzed. A comparison of the computed three-dimensional Eliassen-Palma flows and variations in the total ozone content indicated that the appearance and evolution of ozone miniholes over the North Atlantic, Europe and Siberia are related to changes in wave activity and the direction of vortical transport of ozone by planetary waves. Weakening of wave activity and anomalous transport from the low latitudes may be reasons for the appearance of ozone miniholes. The filling of ozone miniholes is associated with an increase in wave activity. The analysis of these ozone anomalies in the northern hemisphere middle and high latitudes indicates that natural, not anthropogenic factors are responsible for the formation and evolution of ozone miniholes. Figure 1; references: 11 Western.

Monitoring Soot Aerosol in the Air Over the City of Moscow

937NO093A Moscow IZVESTIYA AKADEMII NAUK FIZIKA ATMOSFERY I OKEANA in Russian Vol 29, No 2, Apr 93 pp 213-217

[Article by V. M. Kopeykin, V. N. Kapustin, and M. S. Pekur, Russian Academy of Sciences, Institute of Physics of the Atmosphere]

[Abstract] From February 1989 to December 1991 the Institute of Physics of the Atmospphere of the Russian Academy of Sciences conducted regular measurements of concentrations of soot in the air over the city of Moscow. Aerosol samples were collected around the clock by two sampling devices, one located in the center and the other on the outskirts of the city. At the same time sodar observations of the type of stratification of the lower part of the boundary layer of the atmosphere and of the layer of intermingling were conducted, while information on reverse trajectories of the transfer of air masses and on the direction and velocity of the wind were obtained from the Hydrometeorological Center of the USSR. The correlations between these factors and soot concentrations were determined.

Results of the monitoring of soot aerosol indicated that concentrations were very similar at both sampling stations. This appeared to be a result of the fact that the sources of soot pollution were evenly distributed throughout the city, and that the circulation of air over the city was such as to cause additional transfer and intermingling of pollutants. As a result of this concentrations tended to be the same over the entire urban area.

Conclusions which can be drawn from the results of the monitoring are as follows:

1. Concentrations of soot in Moscow in 1991 were higher than in either of the two preceding years.
2. The soot content in the air over Moscow depends on the output volume of the sources of soot aerosol within the city—(these are mainly related to automobile traffic),—on wind velocity, and on the type of stratification of the boundary layer of the atmosphere.
3. In summer the city is cleared of soot through the arrival of clean Arctic air masses and as a result of convection, while an increase in soot concentration can be observed when surface inversions are present and during the time of the most intense automobile traffic.
4. In winter the highest concentrations of soot occur mainly during surface and raised inversions, and the lowest during uniform stratification and when the intensity of automobile traffic diminishes during the night hours.

Synoptic Analysis and Prediction of Atmospheric Pollution

937N0105A Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No 5, May 93 pp 14-20

[Article by L. R. Sonkin, V. D. Nikolayev, Main Geophysical Observatory; UDC 551.509:318:504.3.054]

[Abstract] The results of a statistical analysis of air pollution in individual cities and in a number of regions are presented. A special classification of synoptic situations was made based on observational data for more than 30 cities. It was found that there is a significant correlation between urban air pollution and some synoptic situations. Situations characterized by positioning of an anticyclone, ridge, trough and also the western periphery of an anticyclone over the investigated region favor the formation of regions of high air pollution. This is manifested particularly clearly relative to the stable ridge of the Siberian High, with which cases of low air pollution are never observed. The formation of regions with a low pollution level is associated with cyclonic situations, particularly with the rear of a cyclone and its cold northern periphery. A high pollution level is observed in regions of a warm front, and also in the warm sector of a cyclone. A cyclonic circulation accompanied by a front is observed twice as frequently in the case of high air pollution as in the case of low air pollution, and this despite the fact that in given situations factors (such as a strong wind and precipitation) may be operative which favor air purification. On this basis methods are proposed for predicting air pollution in cities and regions for a period from one to several days. Figure 1; references 20: 14 Russian, 6 Western.

Response of the Yield of Spring Grain Crops in the Former USSR to Possible Climate Changes (Model Study)

947N0004A Moscow IZVESTIYA AKADEMIYA NAUK: SERIYA GEOGRAFICHESKAYA in Russian No 4, Jul-Aug 93 pp 51-59

BROVKIN, V. A., AND Ye. A. DENISENKO, All-Union Scientific Research Institute of Agricultural Radiology (Obninsk) and Institute of Geography, Russian Academy of Sciences 551.589,631.55.914.7

[Abstract] The functional model used to simulate spring-grain growth divided the growing season into vegetative and reproductive periods, taking into account the monthly average photosynthetically active solar radiation, precipitation, soil moisture, atmospheric carbon dioxide, and air temperature, as well as the phytomass of leaves, stems, roots, and reproductive organs. The model included functions describing the distribution of assimilated substances in the plant organs and the consumption rates of these substances due to respiration. Nitrogen, phosphorus, and potassium were limiting factors in the model. Six climate-change scenarios were tested: global warmings and coolings of 1 and 2.5 degrees Celsius combined with no change, a 5 percent decrease, or a 10 percent decrease in precipitation. Results were obtained for 18 economic regions of the former USSR based on the average conditions in each. Warming by 1 degree substantially improved yields in the Northwest and Eastern Siberian economic regions, the Baltic countries, and Belarus, while cooling by 1 degree decreased yields everywhere except Central Asia and Kazakhstan. All the climate-change scenarios reduced yields in the Volga-Vyatsk, Volga, North Caucasus, and Western Siberia economic regions of Russia and in Moldova, Ukraine, and the Transcaucasus. Temperature changes of plus or minus 2.5 degrees combined with decreased precipitation made practically all areas of the former USSR unsuitable for grain production. Figures 3; references 34: 29 Russian, 5 Western. [4-12595]

Radioactive Pollution of Terrain Resulting From Accident at Tomsk-7 Radiochemical Plant

937N0109A Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No 6, Jun 93 pp 5-8

[Article by Yu. A. Izrael, Ye. M. Artemov, I. M. Nazarov, Sh. D. Fridman, V. I. Zinenko, A. I. Krivoshapko, N. G. Lyashchenko, V. G. Pakhomov, V. A. Chirkov and

Ye. D. Stukin, Global Climate and Ecology Institute, Russian Committee for Hydrometeorology and Russian Academy of Sciences; West Siberian Administration of the Hydrometeorological Service, Russian Committee for Hydrometeorology; Berezovgeologiya State Geological Enterprise; Russian Federation Committee for Geology and Use of Mineral Resources; UDC 504.054:504.3.0.53:661.879(571.16)]

[Abstract] An accident occurred at the Tomsk-7 radiochemical plant on 6 April 1993. A container with approximately 20 m^3 exploded with the escape of uranium. A radioactive track with an area about 100 km^2 was formed in the terrain. An initial reconnaissance was made for determining the general direction of transport and fallout of radioactive substances, followed on 12-13 April by a detailed survey of the snow-covered terrain at 1:100 000. The direction of the survey runs was virtually perpendicular to the axis of the radioactive track; each run was 20 km long. A map shows the polluted area. The energy release of the radioactive products was estimated at 4700 μR x km^2/hour. The total quantity of radioactive products beyond the limits of the industrial site of the plant was estimated at 530-590 curies. It is shown that in the most polluted central part of the track with pollution levels 300 μR/hour or more the accumulated dose of gamma radiation from the radionuclides detected at the time of the survey (ruthenium-103, ruthenium-106, zirconium-95 and niobium-95) will not be more than 1 roentgen during the first year. During subsequent years there will be little gamma radiation from radioactive pollution. Figures 2.

Evaluation of Possible Changes in River Pollution Accompanying Global Warming

937N0109B Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No 6, Jun 93 pp 70-76

[Article by Ye. I. Breslav, L. I. Boltneva and I. M. Nazarov, Global Climate and Ecology Institute, Russian Committee for Hydrometeorology and Russian Academy of Sciences; UDC 556.535.8:551.583(47)]

[Abstract] A study was made of possible changes in river pollution in zones of mixed and broadleaf forests, wooded steppe and steppe in the European territory of Russia, the Baltic states, Belarus, Ukraine and Moldova for three global warming scenarios. Water quality was evaluated using an index taking into account the pollution of river waters, river runoff and the type of water use. The most unfavorable situation with the quality of river waters in the middle latitudes of the European CIS and in the Baltic countries is anticipated with a global warming of about 1.2°C. A further warming, accompanied by an increase in water runoff, should result in a considerable improvement in water quality over almost the entire territory. With a warming by 1.2°C over an area of about 1 200 000 km^2 (46% of the total considered area) in which at the present time the norms are not impaired there will be a worsening of the quality of river waters to 1.5-2.0 of the maximum admissible concentration or more, which will cause definite difficulties in the case of use of these resources for drinking purposes. Further research must be centered on predicting the influence exerted on water pollution by probable changes in the intraannual distribution of runoff. Figures 4; references 9: 7 Russian, 2 Western.

Analysis of Reasons for Aral Sea Dessication

937N0109C Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No 6, Jun 93 pp 77-85

[Article by N. F. Dementyev, Hydrometeorological Scientific Research Center, Russian Federation; UDC 504.3.062.2(262.83)]

[Abstract] The influence of water management activity in the Amudarya and Syrdarya basins on the increase in anthropogenic withdrawals of river runoff and the decrease in level of the Aral Sea is analyzed. The total water withdrawals in the Syrdarya and Amudarya basins increased threefold between 1950 and 1978, from 30 to 103 km^3, with the greatest withdrawal in 1985 (109 km^3. The irrigated area during this same period approximately doubled. During the last decade of the studied period virtually the entire volume of annual water resources was withdrawn for irrigation. The increase in total withdrawals beginning in 1956 did not immediately exert an influence on the decrease in sea volume and decrease in its level because the five-year period 1956-1960 was a period of high waters. As a result the sea received an additional water inflow which stabilized the sea level and caused some increase which continued until 1960. After 1961 the sea level constantly dropped with a brief interruption in 1969-1970 due to the high waters of 1969. The research revealed the quantitative relations between the decrease in the volume (level) of the Aral Sea and the increase in water withdrawals and unreturned expenditures of river runoff in the sea basin. The relative constancy of the natural level and the volume of the Aral Sea persisted under conditions of a relative constancy of the total withdrawals of river runoff in the range 30-40 km^3 as long as the water consumption in the basin did not exceed 40 km^3. A further increase in water consumption in the basin caused a continuing increase in the unreturned expenditures of river runoff, resulting in a corresponding decrease in volume and a drop in sea level. The threat of an ecological catastrophe in the Aral Sea basin is entirely evident. Figures 3; references: 10 Russian.

Environmental Pollution and Radiation Conditions in Russian Territory in March 1993

937N0109D Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No 6, Jun 93 pp 110-111

[Article by Z. I. Mokrousova, N. A. Belova and N. A. Tsybikov, Russian Federal Service for Hydrometeorology and Environmental Monitoring; UDC 504.3.054.(047)(47+57)]

[Abstract] During March 1993 extremely high atmospheric pollution was not registered (in March 1992 one such case was observed), nor were such cases registered in the first quarter of this year (two such cases were observed in the first quarter of 1992). During March in 7 cities (Omsk, Glazov, Tomsk, Kemerovo, Norilsk, Tolyatti, Moscow) in 12 cases the presence of pollutants in concentrations of 10 times the maximum admissible concentrations (MAC) were observed (in March 1992 this was true in 58 cases in 14 cities). In Moscow during March two cases of high atmospheric pollution with ammonia with 28 MAC and two cases of pollution with carbon monoxide with 12 MAC were observed. In this month extremely high pollution levels (MAC greater than 100, with a sharp worsening of organoleptic properties) resulted from 22 accidents in 16 water bodies (in comparison with March 1992 with 25 such events in 17 water bodies). During March 1993 there were 153 cases of high pollution in 103 water bodies, especially rivers. Various cases of oil spills in Russian rivers occurred. During March 1993 radiation conditions in the Russian Federation did not change substantially in comparison with February. The diurnal concentrations of radioactive aerosols in the atmosphere and their fallout onto the underlying surface were at the level of the background values.

Manufacturer Closes Down Production of Buran Tile Material

947Q0019B Moscow ROSSIYSKIYE VESTI in Russian 15 Sep 93 p 5

[Unsigned article: "Today Russia Could No Longer Construct the Buran"]

[Text] The shop for the production of tiles from refractory ceramic material, which constituted the basis for the thermal shielding of the Buran multiply reusable spaceship, has been closed down at the Tekhnologiya Scientific Production Association (NPO) at Obninsk. The Tekhnologiya NPO was the developer and the sole producer of such material in the former USSR. After the actual shutdown of the Buran program there was no call for the unique technology and numerous attempts of the directors of the NPO Tekhnologiya and NPO Energiya to offer the Obninsk thermal shielding material for use in civilian projects (including construction) for the time being have fallen through. At the International Aerospace Show MAKS-93, which was held in Moscow during the period 31 August through 5 September, the NPO Technologiya exhibit with representative ceramic material attracted the interest of specialists. However, the Obninsk ceramics also attracted interest at last year's Moscow Air Show '92, but this never led to the signing of real contracts.

AGRICULTURAL SCIENCE

Pneumatic Disinsection of Vegetable Plantings

947C0045A Moscow ZASHCHITA RASTENIY in Russian No 2, Feb 93 p 24

[Article by V.P. Marmalyukov, M.I. Astakhov, V.P. Polobok, I.T. Korol, L.I. Prishchepa, N.I. Mikulskaya; UDC 635.1/8:631.34]

[Abstract] A 2.8-m-wide experimental pneumatic vegetable planting disinsection unit for class 1.4 tractors developed by the Scientific Production Association of Belarussian Agricultural Mechanization is described. The pneumatic vegetable planting disinsection unit consists of a vacuum chamber which carries an axial-flow controlled output fan and guides for changing the flow direction as well as insect intake chambers. The operating procedure is outlined in detail. A pilot prototype of the PDO-4.2 disinsectization unit has been developed on the basis of this device and has passed preliminary tests at the Belarussian Machine Testing Station. The device manufactured by the pilot plant of the Central Scientific Research Institute of Rural Mechanization and Electrification in Agriculture has been integrated in the vegetable agriculture mechanization system of the Belarus Republic. Figures 1.

BIOTECHNOLOGY

Polymer Lipid Membranes: Production, Properties, and Applications

947C0093A Moscow BIOLOGICHESKIYE MEMBRANY in Russian Vol 10 No 3, May-Jun 93 pp 229-254

[Article by V.V. Chupin, A.V. Anikin, G.A. Serebrennikova, Moscow Institute of Fine Chemical Engineering imeni M.V. Lomonosov; UDC 577.352]

[Abstract] The increasing use of the simulation method in the science of membranes which traditionally employs models membranes—liposomes, monolayers on the water-gas surface, and "black" lipid membranes as well as biological membranes which are highly labile, thus limiting the selection of research methods, and reports about the high stability of polymer liposomes which are used, *inter alia*, to study the mechanical interaction of liposomes with the cells and fix enzymes in the lipid membranes, prompted a review of the preparation of polymer membranes from polymerizable lipids—the closest analogues of natural phospholipids—and using these membranes in simulating membrane-dependent biological processes. Various methods of initiating polymer reactions in lipid bilayers are considered, and the stability of polymer membranes from diacetylene-, dien-, styrene-, methacryloyl-, and thiolipids is analyzed and compared. The issues of polymer membrane applications in simulating the intercellular recognition processes and examining phase transitions are addressed. In particular, the general approaches to producing polymer lipid membranes, the types of polymerizable phospholipids and the properties of polymer membranes, and biological process simulation using polymer membranes are examined in detail. Special attention is focused on protein incorporation in polymer membranes and polymer liposome interaction with the blood component cells (hemocompatible materials). Figures 10; tables 2; references 107: 10 Russian, 97 Western.

Effect of Low Acetylcholine Concentrations on Influx of Ca^{2+} Ions Into *Helix Pomatia* Neurons

947C0093B Moscow BIOLOGICHESKIYE MEMBRANY in Russian Vol 10 No 3, May-Jun 93 pp 317-320

[Article by K.V. Azatyan, I.Ts. Karapetyan, S.N. Ayrapetyan, Biophysics Department at the Armenian Academy of Sciences, Yerevan; UDC 577.352.5: 612.822.6]

[Abstract] The earlier study which showed that low acetylcholine (AKh) doses stimulate the Ca^{2+} influx into the *Helix pomatia* neurons and increase the intracellular cAMP level is continued, and it is noted that the effort failed to establish the neurotransmitter concentration threshold at which the Ca^{2+} exchange changes in the neurons. To bridge this gap, an attempt is made to ascertain the minimum acetylcholine concentration which no longer affects the $^{45}Ca^{2+}$ influx into the *Helix pomatia* neurons. To this end, nervous ganglia of *Helix pomatia* incubated in 2 ml of physiological solution containing 10 μl of the ^{45}Ca isotope with or without addition of 10^{-10}-10^{-18} mole/l of acetylcholine during a 1-120 min time span are investigated. The experimental procedure consisting of two series of tests is outlined. During the first, the effect of low acetylcholine concentrations was studied on snails in a physiologically active state (Jun-Jul) and in the second (involving two sessions)—on snails preparing for hibernal hibernation (late November). The effect of various concentration of acetylcholine on the ^{45}Ca influx into the *Helix pomatia* neurons after various incubation periods is plotted. The study shows that an increase in the incubation period shifts the acetylcholine triggering threshold toward lower concentrations; below an acetylcholine concentration of 10^{-18}-10^{-19} M even after 90-120 min of incubation, acetylcholine no longer affects the ^{45}Ca influx. The findings warrant a serious reevaluation of existing notions of effective neurotransmitter concentrations and open up the possibility of utilizing homeopathic doses of biologically active substances in treatment practices. Figures 3; references 5: 4 Russian, 1 Western.

Short Oligonucleotide Combinations With Elevated Duplex Formation Strength as Joint Primers in Sequencing

947C0128A Moscow DOKLADY AKADEMII NAUK in Russian Vol 331 No 6, Aug 93 pp 751-753

[Article by T.L. Azhikina, V.K. Potapov, S.V. Veselovskaya, V.A. Myasnikov, Ye.D. Sverdlov, Bioorganic Chemistry Institute imeni M.M. Shemyakin at Russia's Academy of Science, Moscow; UDC 517.21.541.69]

[Abstract] One of the principal problems hindering further improvement of primary DNA structure identification methods—the development of ordered sequencing strategies for a planned DNA fragment study—is discussed, and it is suggested that the problem can be resolved by synthesizing a collection of primers of all possible sequences and after obtaining all necessary data on the sequence, selecting the primer for the subsequent step from the primer. Yet the inordinate size of such a collection prompted F.W. Studier to use a combination of shorter oligonucleotide components in place of one long primer. Stacking interaction of the terminal links of the adjacent short nucleotides leads to an elevated stability of the resulting duplexes. A set of three pentanucleotides makes it possible to set up a primer bank containing only 1,024 pentanucleotides, thus lowering the sequencing cost and simplifying the procedure. The use of modified oligonucleotides with an increased affinity for complementary sequences greatly enhances the planned sequencing potential; today, it is possible to substitute primers containing adenine and cytosine with stronger binding analogues. Figures 2; tables 1; references 2: 1 Russian, 1 Western.

Expression Hybrid Genes Containing Sequences Which Encode Human Adrenocorticotropic Hormone in *Escherichia Coli*

947C0128B Moscow DOKLADY AKADEMII NAUK in Russian Vol 331 No 6, Aug 93 pp 767-768

[Article by A.Sh. Parsadanyan, V.Ye. Karapetyan, A.A. Galoyan, Biochemistry Institute at Armenian Republic's Academy of Sciences, Yerevan; UDC 575.1]

[Abstract] The genus specificity of the human adrenocorticotropic hormone (AKTG)—a peptide consisting of 39 amino acids which is produced and secreted in the hypophysis and which stimulates biosynthesis of secretion of corticosteroids in the adrenal cortex—and the desire to avoid unnecessary immune reactions as well as the expense and tediousness of chemical synthesis of the human adrenocorticotropic hormone prompted a study of the expression of the human adrenocorticotropic hormone in the form of a hybrid with *S. aureus* protein A. This hybrid protein can be easily isolated from *Escherichia coli* proteins. This system was used to obtain the insulin-like growth factor IFH-I and to produce the bovine adrenocorticotropic hormone. The plasmids containing most of the *S. aureus* protein A gene as well as the plasmids containing the bovine adrenocorticotropic hormone pUC 19/Δ1, pUC 19/Δ7, and pUC 19/Pro were used to construct recombinant plasmids. The experiment procedure is outlined. The hybrid gene sequence constructed as a result contains the sequences which encode protein A of *S. aureus* and human adrenocorticotropic hormone located in the same reading frame. Synthetic adapter sequences whose specific cleaving will eventually make it possible to isolate the end product from the fused protein are built in between these sequences. The fused protein synthesis detection procedure is described and the possibility of protein A secretion by *E. coli* cell derivatives is established. The conclusion is drawn that the constructed plasmids direct the human adrenocorticotropic hormone-containing fused protein synthesis in *E. coli*. The authors are grateful to A.A. Shulga for help with mutagenesis. Figures 1; references 9: 4 Russian, 5 Western.

EPIDEMIOLOGY, MICROBIOLOGY, AND VIROLOGY

Color Nutrient Media Applications to Sterilization Control

947C0027B Moscow KLINICHESKAYA LABORATORNAYA DIAGNOSTIKA in Russian No 2, Mar-Apr 93 pp 65-67

[Article by M.I. Levi, V.Ya. Bessonova, M.M. Livshits, Moscow Disinfection Station; UDC 579.8.083.13]

[Abstract] The complexity and shortcomings of existing physical, chemical, and bacterial test methods of sterilization control prompted the development of color nutrient media which would make it possible to take into account the outcome of bacteriological control by a change in the color of the medium itself. This would also make it possible to relax the bacteriological skill requirements in evaluating the control procedure outcome and thus expand bacterial control applications. The following three formulations are developed as a result of an exhaustive preliminary experiment: a prepared Hiss medium with a bromocrezol purple (BKP) indicator, a color nutrient medium with a bromocrezol purple indicator, and a color medium with a bromothymol blue (BTS) indicator. The sensitivity of each medium was assessed by its ability to change color after inoculation by small microorganism doses. A comparison of the color nutrient media sensitivity to *Bacillus stearothermophilus* and *B. licheniformis*, a comparison of the *B. licheniformis* spore growth at 37 and 55°C temperatures, the effect of temperature on the *B. licheniformis* ability to grow in the bromothymol blue medium, and the Hiss medium sensitivity with an addition of glucose to the growth of *B. stearothermophilus* spores are summarized. The effort made it possible to develop workable color nutrient media for analyzing the outcome of bacteriological control of sterilization and recommend the Hiss medium as the most efficient; if spores of the *B. stearothermophilus* bacteria grow, the medium changes color

from the original lilac to yellow. The use of color media makes it possible to assess the results by the medium color after an inoculum exposure to 55°C in a thermostat, since the growth of foreign microflora at this temperature is almost impossible. Color nutrient media have successfully passed tests in numerous practical institutions with invariably good marks. Tables 4.

Photoelectrocolorimetric Method of Studying Bacterial Life

947C0027A Moscow KLINICHESKAYA LABORATORNAYA DIAGNOSTIKA in Russian No 2, Mar-Apr 93 pp 61-63

[Article by S.D. Kolpakova, Samara Medical Institute imeni D.I. Ulyanov; UDC 579.24.083.1]

[Abstract] The multiple stage microorganism development nature whereby each stage is characterized by certain morphological, biochemical, antigen, and pathogenic properties resulting in diverse clinical manifestations and the failure to apply modern hardware and light transmission and absorption methods to studying the stage-by-stage microorganism evolution prompted the development of a procedure of using a photoelectrocolorimeter to determine the microorganisms' development stages and examine their properties at each stage. The procedure is based on using a KFK-2MP photoelectrocolorimeter since the bacteria are only 0.6-3 μm in size, and their study calls for an instrument whose dimensions are several times smaller than the subject of inquiry. The proposed method is thus quite suitable because the luminous flux wavelength falls within a 315-980 nm range which is smaller than the bacterial cell by two- to threefold. A day old *Escherichia coli* culture cultivated at a 37°C temperature is the subject of investigation. The experimental procedure is outlined. The bacterial population reproduction curve plotted by traditional microbiological and photoelectrocolorimetric methods are cited. The difference in the curves is attributed to the latter method's higher resolution (by 240 times). The findings confirm the possibility of using the photoelectrocolorimetric method for analyzing bacterial life and demonstrate its obvious advantages, e.g., the higher resolution (making it possible to trace the bacterial life changes at a 5 s interval), promptness, high sensitivity, and low labor outlays. Figures 2; references 5.

Cases of Dirofilariosis in Kazakhstan

947C0157A Almaty ZDRAVOOKHRANENIYE KAZAKHSTANA in Russian No 3(282), Mar 93 pp 56-57

[Article by I.A. Lazutina, L.A. Gorbunova, E.N. Anpilova, S.I. Kozhabekova, Republican Sanitary Epidemiological Station and Scientific Research Institute of Epidemiology, Microbiology, and Infectious Diseases, Alma-Ata; UDC 616.995.132.5.574]

[Text] Abstract. The principal clinical symptoms in patients and epidemiological characteristics are described in the article.

The authors of this report observed four patients, three of whom were identified in Pavlodar and one in Uralsk.

Helminths (*Dirofilaria repens*) belong to the genera of Nematodes and Nemathelminthes and have the dimensions of 100 to 110 x 0.2 mm and, as a rule, parasitize in nodular intumescence under the skin, subcutaneous fat, and the eye.

The *larva migrans cutanea* phenomenon, i.e., a parasite movement over substantial distances under the skin, has been recorded.

Dirofilarioses are transmissive helminths. Humans are infected with them in the locations where invaded animals proliferate (dogs, foxes, wolves, etc.) through mosquito bites. References: 4.

Key words: Parasitism—A form of cohabitation of two organisms advantageous for one and harmful for the other species; filaria—several species of white filamentary helminths; Dirofilaria—one of the filaria species; *larva migrans cutanea* phenomenon—parasite movement over a considerable distance under the skin; transmissible diseases—diseases whose etiological agents are transmitted by vectors.

Several dozen cases of parasitizing of animal filaria in humans identified as Dirofilaria have been recorded in the world, including the CIS. Moreover, single, usually sexually immature female and less frequently, male filaria have been detected in the organism of most patients. Helminths, as a rule, parasitize in nodular subcutaneous intumescence, subcutaneous fat, and the eye.

Filaria have been found in people living in the territories with subtropical and moderate continental climate. Cases of Dirofilaria have been described in the maritime kray [3] and Turkmenia [2]. In Kazakhstan, the first cases of local Dirofilarioses infestation were described by T.K. Besedina and N.A. Khokholnikova [1]. Both cases were identified in Alma-Ata in 1960-1961, and in the author's opinion, the southern Kazakhstan and Urals oblasts are regarded as likely infestation areas [4]. The latter two Dirofilarioses cases were recorded in Kzyl-Orda in 1964 and 1968.

The authors of this report have observed four Dirofilariosis patients in the last six months. Due to the increased frequency of the rare helminthism occurrence on the republic territory, it would be interesting to examine the principal climatic symptoms on invasion among the patients, especially its epidemiology.

Patient B, born in 1940, is a biology teacher in a Pavlodar secondary school. She fell acutely ill on 19 Mar 90, felt a sharp pain and an edema of the left eye. For several days prior to that, she experienced headaches every evening. On 20 Mar 90, she sought medical help at

a trauma center of the oblast hospital where a filamentary helminth with a 110 x 0.2 mm size was removed from under the mucous membrane of the eyeball.

Patient S, born in 1954, is a designer engineer working in Pavlodar. A hyperemic spot which, with time, transformed into a 1 x 5 mm node, appeared in the left groin area. The *larva migrans* phenomenon, i.e., a parasite movement over a considerable distance under the skin, was detected. The process was accompanied by pain in the elbow and radiocarpal joints and an edema of the tongue.

On 25 Sep 90, a 110 x 0.2 mm nematode was pulled from under the eyeball mucous membrane.

Patient P, a retiree born in 1930, is also a resident of Pavlodar. She fell ill in late February 1992 when she noted a hyperemic tumor-like formation on the forehead. She was bothered by severe headaches. The tumor disappeared several days later. On 8 March, she had sharp pain in the right eye and developed photophobia and lacrimation. On 20 March, a 106 x 0.2 mm nematode was removed from under the eyeball mucous membrane at the eye department of the oblast hospital.

Patient M from Uralsk is a retiree. In February 1992, she noted an edema on the front of the right crus and a zigzag-shaped reddening as well as pain in the area of the knee joint. Some time later, the reddening moved lower, and a pea-sized tumor appeared on the rear surface of the right crus. The movement of the reddening was accompanied by itching. After self-treatment of the tumor with Vishnevskiy ointment, no recovery was noted. After she sought medical assistance, the tumor was operated on, and a white 110-mm-long nematode was pulled from the purulent wound.

All patients recall numerous mosquito bites during the summer and none left Kazakhstan. The helminths extracted from them were sent to the republican sanitary and epidemiological station for identification; they are encapsulated preadolescent males belonging to the *Dirofilaria repens* species.

Dirofilarioses are transmissible helminthisms. They are widespread in the world among dogs, but foxes, wolves, coyotes, tigers, and wild cats may be the final "host," although humans are only accidental "hosts." Humans are infected in the areas of habitat of invaded animals through mosquito bites of the *Aedes, Cubex* and *Anopheles* species. The filaria development phase prior to the invasion stage depends on the intermediate "host" (10-20 days). After entering the mosquito's stomach together with the blood, the *Drepens* microfilaria migrate into the insect body cavity for 1.5 days. After reaching the invasion stage, the larva migrate into the head and mouth organs of the mosquitos and from there—into the human organism through bites.

An increase in the gnat population was noted in Pavlodar and Uralsk between 1982 and 1991: the mean seasonal indicator rose by twofold. Such a widespread proliferation of insects in the aforesaid regions is the factor which determine the unfavorable situation with the transmissible disease, including Dirofilariosis.

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MEDICINE AND PUBLIC HEALTH

Cryopreservation of HIV-Producing Cells

947C0040A Kiev PROBLEMY KRIOBIOLOGII in Russian No 3, Jul-Sep 93 pp 49-53

[Article by I.Yu. Dranov, Sh.U. Yangulov, A.N. Terentyev, S.R. Sayamov, Rostov-on-Don Scientific Research Antiplague Institute; UDC 57.086.13:576.828]

[Abstract] The urgency of HIV research and the need to develop reliable yet accessible methods of storing infected cells, even HIV-producing cells, necessitated the development of improved freezing conditions for HIV-infected or HIV-producing cells, a study of their viability and the viral antigen expression on the cell surface and during storage in liquid nitrogen, and preservation of the representative morphology of the newly forming viruses. To this end, the H-9/III-B inoculated cell line infected with HIV-I (VICh) from Bulgaria cultivated as a suspension in the RPMI-1640 medium (by Flow, U.K.) with a 15% embryonic calf serum is used. The experimental procedure is outlined. Glycerin and dimethylsulfoxide (DMSO) were used as cryoprotectors. The cell viability and HIV antigen expression with various cryoprotectors at different freezing rates and the cell viability and HIV antigen expression at various points during storage are summarized, and the recovery dynamics of virus-producing cells after cryopreservation are plotted. The findings show that the frozen cell concentration does not affect subsequent cell viability; single multinuclear cells which disappeared after freezing, probably due to destruction, were detected on the eighths and ninth day. A comparison reveals that dimethylsulfoxide is less suitable for this conservation procedure. The highest

survivability of the H-9/III line infected with HIV-1 was observed after freezing in a 10% glycerin solution at a 1°C/min rate to a -70°C temperature with subsequent specimen placement in liquid nitrogen. The cells maintained their original viability and ability to express HIV antigen after an extended (12 months) storage of cryopreserved samples in liquid nitrogen. The above method makes it possible to preserve HIV isolates and HIV-producers for an extended period in labs with a minimum set of cryogenic devices. Figures 2; tables 2; references 6: 5 Russian, 1 Western.

Activation Therapy of Limb Injuries Complicated by Wound Infection With Millimeter Wavelength Radiation

947C0153B Moscow MEDITSINSKAYA RADIOLOGIYA in Russian Vol 37 No 7-8, Jul-Aug 92 pp 43-45

[Article by N.D. Devyatkov, Yu.F. Kamenev, Ye.V. Polyak, T.B. Rebrova, A.G. Sarkisyan, Yu.A. Toporov, Z.I. Urazgildeyev, Central Traumatology and Orthopedics Institute imeni N.N. Priorov, Moscow, and Istok Scientific Production Association, Fryazino; UDC 616.155.33-008.6-073.916]

[Abstract] The role of EHF (millimeter wavelength) treatment as a means of nonspecific activation therapy and the effect of electromagnetic radiation (EMI), especially low-intensity millimetric radiation, on recovery processes are examined. To this end, the outcome of EHF treatment of 66 patients with limb injuries complicated by would infection with the help of the Yav-1 device under optimum operating conditions is discussed in detail. The patients were divided into two groups: 49 injured and 17 control patients. The irradiation duration varied within 30-60 min, and therapy consisted of 10-15 procedures whereby the wound or chest area (or both) were exposed. The electromagnetic irradiation duration must be sufficient for the development of adaptation reactions (AR) in the organism, or activation or training. The morphological and functional changes in the course of adaptation reactions under radiation, the dynamics of the organism's adaptation reactions under EHF therapy, and the dynamics of the organism's adaptation reaction changes during EHF therapy as a function of exposure localization are summarized. The use of adaptation reactions makes it possible to substantiate the selection of exposure duration and method and the number of treatment sessions for patients with limb wounds complicated by purulent infection. This helps to manifest the therapeutic properties of EHF treatment more fully. It is noted that the above method does not exhaust all possible millimeter wave treatment methods. Tables 3; references 20.

Status of Immune System Exposed to Low-Level Ionizing Radiation: Studies in the 10-Kilometer Zone of the Chernobyl Disaster

937C0332A Moscow RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA in Russian Vol 33 No 1, Jul-Aug 93 (manuscript received 30 Sep 92) pp 470-478

[Article by V. A. Malyzhev, I. I. Pelevina, G. G. Afanasyev, S. M. Gordiyenko, I. B. Gubriy, T. I. Klimenko, R. G. Lukashova, I. V. Petrova, and T. A. Sergeyeva, Institute of Experimental Radiology,Ukrainian Radiation Medicine Research Center, Kiev, and Institute of Chemical Physics imeni N. N. Semenov, Russian Academy of Sciences, Moscow, under the rubric "Investigation of the Sequelae of the Chernobyl Disaster"; UDC 614.876:621.038.58]

[Abstract]Studies were carried out on (DBAxC57Bl)F_1 and DBA mice exposed to radiation in cages placed on radionuclide-contaminated soil for 1, 7 or 14 days in the village of Yanov; dosage of gamma rays constituted 0.024, 0.168 and 0.336 Gy. Proliferation of T lymphocytes was activated with all these doses. With the two lower doses there was accumulation mostly of the T helper type and with the highest dose, of the N suppressor type. In some cases mice were exposed to x-rays in single doses of 0.25-1.0 Gy. Changes in antibody production, relative weight and cellularity of the thymus and spleen, T lymphocyte content of peripheral blood and spleen, subpopulations of T lymphocytes in the spleen, ratio of Lyt1+/Lyt2+ cells in peripheral blood and spleen. Labeled monoclonal antibodies and phenotypic markers, immunization with ram erythrocytes, lymphocyte cultures, ^{3}H-thymidine uptake and other methods were used to test humoral immunity, hemolysin and hemagglutinin titers, proliferative activity of splenocytes, blast formation and radioactivity of samples, at different post-exposure times. With lower doses there was activation of some immunological effector functions and with higher ones they were inhibited. The demonstrated proliferation of lymphoid cells, including suppressors, as the dosage of ionizing radiation builds up in the case of prolonged exposure to low levels thereof, triggers autonomous control attenuating the induced increase in lymphocytes and inhibiting effector manifestations of immunity. More precise interpretation of immunological responses of humans who had been in the zone of the Chernobyl accident or other contaminated regions is recommended, since use of immunostimulants is not only inadvisable, but even harmful in such cases. Figures 7, tables 2, references: 5 Russian, 4 Western.

Immunological Methods in Epidemiological Monitoring of the Public Exposed to Radioactive Iodine as a Result of the Chernobyl Accident

937C0332B Moscow RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA in Russian Vol 33 No 1, Jul-Aug 93 (manuscript received 10 Oct 92) pp 479-483

[Article by A. M. Poverennyy, A. P. Shinkarkina, V. K. Podgorodnichenko, V. S. Parshin, and A. F. Tsyb, Medical Radiology Research Center, Russian Academy of Medical Sciences, Obninsk, under the rubric "Investigation of the Sequelae of the Chernobyl Disaster" ; UDC 614.876:621.039.58]

[Abstract]Immunological (modifications of passive agglutination of particles and enzyme immunoassay, agglutination of gelatin particles loaded with microsomal antigen, and radioimmunoassay of thyroid microsomal and antimicrosomal antibodies) and ultrasound screening (of the thyroid) methods were compared in a study of 6398 inhabitants of Korosten, Zhitomir Oblast, at the time of the Chernobyl disaster. Ultrasound screening revealed changes in the thyroid in 108 cases; serum samples were taken from these and 22 subjects without changes for demonstration of antibodies to the microsomal fraction of the thyroid using immunological methods. There was a high degree of coincidence of diagnoses made by ultrasound and immunoassays, which indicates that the latter can be used for the said population to supplement the ultrasound findings. Figures 2, tables 1, references 7 Western.

Modification of Adrenergic Function of the Heart Under the Effect of Radioecological Conditions in the 10-Kilometer zone of the Chernobyl Accident

937C0332C Moscow RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA in Russian Vol 33 No 1, Jul-Aug 93 (manuscript received 25 May 92) pp 484-488

[Article by L. M. Lobanok, A. Ye. Kiriyenkov, and N. V. Gerasimovich, Institute of Radiobiology, Belarus Academy of Sciences, Minsk, under the rubric "Investigation of the Sequelae of the Chernobyl Disaster"; UDC 574:538.1.04]

[Abstract]Experiments were carried out on rats kept in the 10-km zone of the Chernobyl disaster (flood plain of the Pripyat River) for one month, exposed at dose rates of 20 mR/h. Radionuclides were assayed in the perfused isolated heart right after the exposure period and 6 months later, and findings were compared to control rats that were not exposed to radioactivity. Records were kept of heart rate, systolic, diastolic pressure, rate of rise and drop of pressure, and volumetric blood flow rate. The membrane filtration method, with ^{3}H-alprenol hydrochloride and propranolol antagonists, was used to test β-adrenoreceptors, with determination of specificity, binding sites and hormone affinity of the receptor. The experimental group of rats showed changes in amount, structural and functional properties of β-adrenoreceptors of the myocardium. Rate of contraction of the isolated heart and volumetric coronary flow diminished 6 months after exposure. It can be assumed that restoration of β-receptor density after 6 months and their affinity for agonists is related to impaired interaction of β-adrenoreceptors and N protein. The functional state of the heart did not change with 30-day exposure to the contaminated zone, but there was alteration of mechanisms of its adrenergic regulation. Figures 1, tables 1, references: 10 Russian, 3 Western.

Statistical Criterion of Contamination Heterogeneity in Studies of Biotic Factors of Radionuclide Migration

937C0332D Moscow RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA in Russian Vol 33 No 1, Jul-Aug 93 (manuscript received 18 May 92) pp 489-498

[Article by A. P. Kravets, D. M. Grodzinskiy, Yu. A. Pavlenko, N. N. Zhdanova, A. I. Vasilevskaya, and O. I. Sinyavskaya, Institute of Cell Biology and Genetic Engineering, Ukrainian Academy of Sciences, Kiev, and Institute of Microbiology and Virology, Ukrainian Academy of Sciences, Kiev, under the rubric "Investigation of the Sequelae of the Chernobyl Disaster"; UDC 574.41.5:539.163]

[Abstract]This study was motivated by the chief distinction of of Chernobyl-related contamination from the standpoint of soil-plant migration of radionuclides, i.e., its spatial and aggregate heterogeneity. An independent statistical index of contamination heterogeneity was offered: the Bravais-Pearson coefficient of linear correlation between soil and dry plant biomass radioactivity for demonstration of "hot" particles as an indication of relative extent of contamination. Accumulation of β emitter radionuclides was studied in the above-ground portions of rye, oats, barley, wheat and peas raised in 1.5-liter containers with sod-podzolic soil taken in the 10-km zone of the Chernobyl disaster, as well as effects of soil micromycetes (Cladosporium cladosporioides and Penicillium rosco-purpurent) cultivated in Czapek's liquid mineral medium on dissolution of hot particles. Cesium-137 and Cerium-144 radionuclides were absorbed at variable rates by the plants, depending on stage of growth. The rates were higher when in subsequent planted specimens, mainly in rye and oats, affected by their precursors. Experimental data on radionuclide migration were obtained with the use of this index, and its usefulness was validated. Figures 2, tables 2, references: 8 Russian, 2 Western.

Exposure of Cells in Tissue Culture and in Animals (Mice) in 10-Kilometer zone of the Chernobyl Accident

937C0332F Moscow RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA in Russian Vol 33 No 1, Jul-Aug 93 (manuscript received 2 Apr 93) pp 508-520

[Article by I. I. Pelevina, G. G. Afanasyev, V. Ya. Gotlib, A. A. Alferovich, M. M. Antoshchina, N. I. Ryabchenko, A. S. Sayenko, I. A. Ryabtsev, and I. N. Ryabov, Institute of Chemical Physics imeni N. N. Semenov, RAN [Russian Academy of Sciences], Moscow, Medical Radiological Research Center, Russian Academy of Medical Sciences, Obninsk, and Institute of Evolutionary Animal Morphology and Ecology imeni A. N. Severtsov, RAN, Moscow, under the rubric "Investigation of the Sequelae of the Chernobyl Disaster"; UDC [577.2+576]:539.1.04]

[Abstract]Studies were carried out in order to demonstrate a set of disturbances on the cellular, molecular, biochemical and whole organism levels after exposure to the disaster zone, as well as enhanced sensitivity to subsequent acute irradiation. Experiments were carried out on (CBAxC57Bl)F_1 mice in cages with wire mesh on all four sides and HeLa cell (carcinoma of the human cervix) cultures in plastic vials placed (in a roofed area) directly on contaminated soil for 1-12 days, as well as control animals and cultures kept in a clean area, with the same climate, beyond the 30-km zone of the disaster area. Cytogenetic studies were carried out to determine HeLa survival rate, number of micronuclear and giant HeLa cells, which revealed that there was enhanced sensitivity of the cells to subsequent acute irradiation, demonstrable for 12-15 generations or more after exposure in the disaster zone, and it is a function of doses of chronic and acute radiation. Genetic studies were made of bone marrow somatic cells of experimental animals and revealed the most appreciable changes in number of aberrations per cell, and in chromosome type of aberrations, as well as lesions to bone marrow stem cells, disintegration of thymus chromatin indicative of interphase death, and decrease in peripheral blood leukocytes. Figures 1, tables 8, references: 15 Russian, 6 Western.

Change in Animal Radiosensitivity After Exposure to Zone of Chernobyl Disaster

937C0332E Moscow RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA in Russian Vol 33 No 1, Jul-Aug 93 (manuscript received 7 Apr 93) pp 499-507

[Article by A. A. Konradov, N. V. Lyubimova, and I. I. Pelevina, Institute of Chemical Physics imeni N. N. Semenov, Russian Academy of Sciences, Moscow, under the rubric "Investigation of the Sequelae of the Chernobyl Disaster"; UDC [577.2+576]:539.1.04]

[Abstract]Changes in radiosensitivity were studied in experiments onvarious lines of mice: (CBAxC57BL6)F_1, (DBAxC57Bl)F_1 and DBA2, kept in metal cages (wire mesh, sheltered from rain and direct UV light) in the village of Yanovo, on the border of the "brown forest" in the zone of the Chernobyl disaster. Feed and water were brought in from Chernobyl, with a control group of intact mice in clean zones. Exposure time ranged from 1 to 14 days, and dose rate was 100 mR/h, after which experimental and control animals were taken to Moscow and exposed to acute radiation in doses of 3.0, 5.0, 7.0 and 9.0 Gy, at a dose rate of 2.32 Gy/min,after 2, 7 and 30 days. Effects were evaluated using the χ^2statistical criterion of reliability. Figures illustrate comparative survival rates of control and experimental animals as a function of time after acute irradiation. Radiosensitivity to subsequent acute exposure was modified in animals exposed to radiation in the disaster zone, the direction and intensity of this effect were a function of interval between exposure in this zone and acute irradiation. It is suggested that there are additional factors in the disaster zone that are involved in altering animal sensitivity to subsequent exposure to radiation. Figures 10, tables 1.

Fetal Tissue Transplants at MIBM

947C0001A Moscow MEDITSINSKAYA GAZETA, in Russian 26 Mar 93 p 4

[Article by Andrey Semenov, under the title: RThe Fruits of Abortions: The Transplantation of Human Embryonal Tissues: TKnow-howU and EthicsS, under the rubric: RWhatUs New in MedicineS]

[Text] An International Institute of Biological Medicine [MIBM] has been created at the Russian Scientific Research Center of Perinatology, Obstetrics, and Gynecology. Investigations and treatment of patients suffering, as commonly believed, from incurable and fatal illnesses, e.g., Down syndrome, diabetes, ParkinsonUs disease, AlzheimerUs disease, and many others, including various immune system deficiency syndromes, will treated in it. Doctor of Medical Sciences, Professor Gennadiy Sukhikh, who has become its General Director, has headed the Institute. The transplantation of human embryonal tissues is the method of treatment of so extensive spectrum of diseases.

The first studies in this sphere appeared as far back as the 1920s, and moreover, in the USSR, recounted Chairman of the Council of the MIBM, Dr. Michael Molnar, an American of Hungarian extraction. But due to the exceptionally powerful anti-abortion movement in the US and Western Europe, governmental support of research projects, including the use of human fetal

tissues, is so restricted that the progress achieved by Western medicine in this field is very slight for practical purposes. As a result, the development of new treatment technologies along these lines has not been noted. Russia is a different business.S

Russia is in fact a different business. Abortions had already been permitted in the Soviet Union for several decades, and until the present, have unfortunately remained the main method for the regulation of the birth rate; this is supported by the existing public health system. About four million abortions are carried out annually within the walls of medical establishments, and presumably as many criminal abortions. Thus, the resources of human embryonal tissues which are intended for use in the MIBM are comparable only with the reserves of oil and gas.

At first there were funds, and facilities, equipment, and personnel as well. The Russian Scientific Research Center of Perinatology, Obstetrics, and Gynecology of the Russian Federation Ministry of Health and the Biocellular Research Organization, Ltd. (USA) created the Russian joint-stock company, RMIBMS, officially registered in Russia. The charter fund was distributed in the following manner: Biocellular Research Organization, Ltd. - 51 per cent; Center - 49 per cent. Such a distribution of contributions will undoubted be reflected, sooner or later, in the economic policy of the MIBM and the level of interference in its affairs of the Russian Ministry of Health.

The Center of Perinatology, Obstetrics, and Gynecology is a recognized leader in the country in this field, and it has been entrusted with the development of medical indications and technologies for the interruption of pregnancy at various points of the gestation period. It has been decided that the Department of Human Reproduction will supply the MIBM with the necessary quantity of embryonal tissues and carry on medical research and the treatment of patients.

The obligations of the Biocellular Research Organization include the equipping of the laboratory for the isolation and preparation of the fetal tissues for the purpose of their subsequent transplantation.

Leading specialists of Russia, Europe, and the USA form the medical personnel of the MIBM. A Scientific Consultation Council has been formed, consisting of 15 major scholars of various fields of medicine, the overwhelming majority of whom are members of the Russian Academy of Medical Sciences. An agreement has been reached with the Russian GovernmentUs Medical Center regarding the use of its facilities. Thus, there is no doubt that the Institute's development will not encounter serious impediments, regardless of the contentions and objections of ethicists, legal scholars, and the church. Is this for good or ill? The dispute has already heated up. The German magazine, Die Stern declared the following in its article on the work of the MIBM: In the majority of countries the use of fetal cells for these purposes is generally prohibited out of the considerations of elementary ethics. And those scientific centers which conduct research along these lines utilize individual embryos... which the obtain after the decision of competent commissions, with observation of all ethical norms and with the full and voluntary consent of the women. Moreover, the German journalists accused MIBM specialists of using five-month fetuses.

The Director of the Russian Scientific Research Center [RNITs], Vladimir Kulakov, has been compelled to justify himself and to prove that only nonviable embryos, weighing up to 500 g, the results either of spontaneous abortions or medical abortions, have been used for medical purposes. Such manipulations with embryos that have not reached the half-kilogram boundary do not contradict either Russian law or the international system of calculating infant mortality. Previously this valuable biological material was simply liable to be thrown out.

The Russian Ministry of Health has granted the Institute the right of expert review in the field of transplantation of human fetal tissues. The new technology has also obtained in the RF governmentUs Department of Medicine.

The mechanism of treatment has not yet been studied completely. Nevertheless, there already are available, in the words of MIBM researchers, statistics and clinical data that indicate the high degree of effectiveness of preparations of embryonal tissues.

We have at our disposal Tknow-howU which enables us both to store and to prepare tissues for transplantation, says Gennadiy Sukhikh. They are reduced to pharmaceutical form (something like a jelly) and are placed in test-tubes, from which the material for injection is taken.

We obtain liver, pancreatic, brain, kidney tissue... Up to 27 types of tissues are used. Special preservative solutions are added.

Preliminarily we carry out histological, biochemical, and virological analyses. Testing for the presence of hepatitides, HIV infection, and syphilis is obligatory. The list of analyses will be expanded continually.

RA preparation from a specific types of tissues or their combination is administered to a patient, depending upon his illness.

What is the percent of useful outcome out of the total volume of tissue you obtain?

RI thinks 10-15 percent. But, taking the effectiveness of the preparations into account, that is not so low. For the treatment of burns, for example, there is enough tissue from one fetus; three to four fetuses may be required for the treatment of female infertility, when there is the possibility of compensating the ovaries.

How many first-class fetuses does the Institute need in a year?

About 500 abortions are required. There already is an agreement with several of the capital's regional antenatal clinics. When the system will be organized and the women recognize that the abortion can be done at the highest medical level, without detriment to reproductive function, the problem of supplying the Institute will be solved. However, at first we expect some shortage.

Physicians throughout the word are struggling to reduce the number of abortions, while today it seems that you are interested in increasing their number. Isn't this amoral?

The number of abortions in the world and here in Russia will decrease. This is inevitable. And our interest infetal tissue will hardly affect the statistics. Moreover, humanity will never entirely relinquish abortions.

Do you not fear criticism of your activities?

What we are doing of course destroys many moral stereotypes. But we are physicians, and thus, rationalists.

Aren't you in danger of the fact that commercialization of this type of treatment may lead to moral catastrophe, or even to crimes?

Human embryonal tissues will never be the object of commerce, since this field has always been under the professional control of the health protection system. That means that nowhere and to no one should the thought occur that abortions could at some time become an object from which material benefit is extracted, if medical science discovers an opportunity for the use of human embryonal tissues in treatment technologies.

All of our pediatric patients will be hospitalized together with their parents in the pediatric unit of the Central Clinical Hospital of the Russian Government's Medical Center. Adult patients will undergo treatment in the corresponding departments of the Central Clinical Hospital [TKB], which, from the point of view of its material and technical level, is equipped and staffed in accordance with the standards of the US and the countries of Western Europe.

RI would like to note that the WHO has been familiar with our project since the beginning of its existence, follows its development, collaborates with us at present, and intends to preserve it in the future. When the methodology will be definitively developed and standardized, the WHO may recognize the MIBM as a collaborative center.

Effectiveness of Zhiger' Lactate Product in Prevention and Treatment of Iron Deficiency Anemia

947C0158A Almaty ZDRAVOOKHRANENIYE KAZAKHSTANA in Russian No 3(282), Mar 93 pp 61-64

[Article by Yu.A. Sinyavskiy, I.K. Timofeyeva, K.M. Mendigaliyeva, Scientific Center of Regional Nutrition Problems, Alma-Ata; UDC 641.56:577.4+616-08+612.273.664.002:616-084]

[Abstract] The high incidence of iron deficiency anemia which, according to WHO, affects 84-90% of women in some parts of the world, and the lack of data on the assimilability and side effects of iron preparations prompted the Scientific Center of Regional Nutrition Problems at the USSR Academy of Medical Sciences to develop a new lactic product—Zhiger—with a specific antianemic effect. It is prepared on the basis of cow's milk with a special *serum lactis* or whey, vitamins, trace elements (Fe and Cu), and other biologically active components. The product has good organoleptic indicators and contains 2.5-2.7 g of protein, 2.4-2.6 g of fat, and 3.6 g of carbohydrates per 100 ml. Clinical tests of the new preparation were carried out at the Alma-Ata oblast hospital on anemic patients and patients diagnosed with chronic gastritis. The behavior of the hemoglobin, erythrocyte, color index, serous iron, and erythrocyte sedimentation rate (SOE) in the blood before and after treatment with Zhiger, the behavior of certain hemopoietic indicators in anemic patients against the backdrop of gastritis before and after treatment with Zhiger, and the behavior of certain hemopoietic indicators in anemic patients before and after therapy (control group) are summarized. The findings demonstrate that Zhiger leads to a verifiable change in the hematologic indicators when used on patients with anemia of first degree. In patients with anemia of second degree, treatment resulted in positive blood indicator dynamics. Tables 4.

Use of Therapeutic Soft Contact Lenses for Correcting Blepharospastic Blindness After Light- and Medium-Gravity Eye Burns

947C0037A Moscow VOYENNO-MEDITSINSKIY ZHURNAL in Russian No 7, Jul 93 pp 32-33

[Article by N.A. Ushakov, S.A. Novikov, E.V. Muravyeva, A.F. Gladkikh, V.I. Pirozhkov; UDC 617.751.98-02:617.7-001.17-036.18]-76]

[Abstract] The issue of blepharospastic blindness, usually as a result of battlefield wounds, is addressed, and the shortcomings of known methods of cupping off this phenomenon are noted. The use of soft contact lenses (MKL) first introduced in the 1960s and their therapeutic properties, i.e., the ability of creating favorable conditions for the recovery of regenerative processes and protecting the damaged eye from infection as well as retaining the drugs in damaged tissues for a longer time, is considered. The outcome of eye burn treatment using

soft contact lenses at various burn gravities, the visual results of eye burns after treatment using soft contact lenses, and the anatomical outcome of eye burns after treatment using soft contact lenses are summarized. The conclusion is drawn that soft contact lenses may be quite effective in correcting blepharospastic blindness and removing or alleviating the corneal syndrome and may be recommended for use in ophthalmic therapeutic films. Tables 3.

Possibility of Assessing Zaporozhye Reservoir's Ecological Capacity by Heavy Metals

947C0159D Kiev GIDROBIOLOGICHESKIY ZHURNAL in Russian Vol 29 No 2, Mar-Apr 93 pp 85-90

[Article by A.I. Korableva, Institute of Natural Resource Management and Environmental Problems at the Ukrainian Academy of Sciences, Dnepropetrovsk; UDC 574.5+502.3(282.2)]

[Abstract] Comprehensive uses of the Zaporozhye reservoir accompanied by a heavy man-caused burden due to agroindustrial agglomeration increase the urgency of the task of assessing the ecosystem's capability of assimilating the ingress of contaminants and determining the level of their environmentally permissible concentrations. In particular emphasis must be placed on assessing the constantly increasing intake of heavy metals which accompany man-caused pollution due to their mutagenic, teratogenic, and toxic effects. A formula for calculating the environmentally permissible or critical concentration of the contaminating elements is derived, and the year-to-year dynamics of heavy metals in the Zaporozhye reservoir, their Clark values, and concentration in the water-soluble fraction, the year-to-year dynamics of bottom sediment contamination in the Zaporozhye reservoir with heavy metals and their Clark values, and concentration in the water-soluble fraction, and a calculation of the ecologically permissible copper concentration and assimilation capacity of the Zaporozhye reservoir ecosystem for Cu are summarized. The analytical critical Cu concentration of 9.0 μg/l is lower than the commonly accepted MPC in the fishery industry (10.0). The findings show that the Zaporozhye reservoir ecosystem is at the limit of its ability to assimilate man-caused copper contamination. Tables 3; references 35.

Higher Aquatic Plant Phytocenoses in Kiev Reservoir Under Acute Radionuclide Contamination Conditions

947C0159C Kiev GIDROBIOLOGICHESKIY ZHURNAL in Russian Vol 29 No 2, Mar-Apr 93 pp 46-53

[Article by V.M. Klokov, N.N. Smirnov, S.Ya. Kozina, I.Yu. Ivanova, Z.O. Shirokaya, Hydrobiology Institute at the Ukrainian Academy of Sciences, Kiev; UDC [581.526.3:577.34](282.247.32)]

[Abstract] The high bioindicator potential plant life in studies of the impact of radioactive water contamination after the Chernobyl nuclear power plant accident (1986-1991) prompted a broad range of research into the plant phytocenoses in the Kiev reservoir. To this end, the character of changes in the Kiev reservoir surface vegetation under the effect of acute radionuclide contamination and accumulation levels of the principal radionuclides in the vegetation mass were investigated. In so doing, overgrown areas were assessed by the aerovisual method, and the structure of the most important vegetation systems was studied by the transect method using data obtained by large-scale aerial photography survey of the Kiev reservoir vegetation in 1983, i.e., three years before the Chernobyl nuclear power plant accident, as a frame of reference. The study reveals considerable changes which have occurred since the accident and which cannot be attributed to multiyear vegetation successions or the characteristics of the hydrological conditions during this period. In particular, the ecological areal of plants of the *Potamogeton* genus has shrunken considerably, probably due to its low radiation resistance and high ^{137}Cs and ^{90}Sr accumulation ability. The conclusion is drawn that large tracts of aeroaquatic vegetation play an unequal role with respect to the ingress of radionuclides into the bottom sediments and water depth, depending on their structural characteristics. By mowing vegetation and changing the level conditions one can alter the correlations between different types of aquatic plants and thus develop an optimum method by which the vegetation systems affect the radiation environment in a certain reservoir section as a function of the contamination character. Figures 7; references 6.

Dnepr Basin River Contamination With ^{90}Sr Based on Measurement Data Using Mollusk Shells as Bioindicators

947C0159B Kiev GIDROBIOLOGICHESKIY ZHURNAL in Russian Vol 29 No 2, Mar-Apr 93 pp 38-46

[Article by L.I. Frantsevich, T.N. Zakharchuk, A.V. Kornyushin, A.A. Yermakov, Zoology Institute at the Ukrainian Academy of Sciences, Kiev; UDC [577.34:(574.64:594)](282.247.32)]

[Abstract] Failure to implement numerous suggestions to use biological entities, including mollusks, for assessing the man-caused contamination of the environment, became an impetus for describing the pattern of the Dnepr river basin area contamination with ^{90}Sr of the Chernobyl origin plotted on the basis of β-radioactivity measurements taken in fresh water mollusk shells. The study is based on a collection of 630 mollusk samples most of which were taken in 1990-1991 from rivers in the Dnepr basin. Mostly fresh water mollusk of the *Viviparus, Contectiana, Lymnaea s.str., Planorbarius, Unio, Anodonta, Colletopterum,* and *Dreissena* genera were selected for the radiometry study, and *Succinea, Bradybaena, Cepaea,* and *Helix* land snails were used for comparison. A correction for natural activity of ^{40}K was

made. The background β-radioactivity of mollusk shells from the collection gathered before the start of nuclear tests in the atmosphere and water was close to 50 Bq/kg due to *40*K while more than 90% of β-activity in the shells collected in the Chernobyl fallout pattern can be attributed to ^{90}Sr. This is evident from the energy characteristics of the β-particle flux, a good correlation between the specific activity of shells from ^{90}Sr contaminated terrain or water, and differences in the β- and γ-activity ratios in fallout patterns with different radionuclide compositions. On the other hand, the mollusks' individual variability and taxonomy differences make only a slight contribution to the spread of experimental data. The conclusion is drawn that snail and mollusk shells are a convenient biological indicator of man-caused contamination and water quality and should be used extensively in areas with operating nuclear power plants and other installations. It is noted, however, that the Kursk, Smolensk, Khmelnitskiy, Rovno, and Zaporozhye nuclear power plants are not causing detectable river contamination at this time. Figures 5; references 8: 5 Russian, 3 Western.

Anabaena Variabilis Kuetz Response to Toxic Effect of Zinc Ions

947C0159A Kiev GIDROBIOLOGICHESKIY ZHURNAL in Russian Vol 29 No 2, Mar-Apr 93 pp 34-37

[Article by L.N. Voloshko, O.V. Gavrilova, Evolutionary Physiology and Biochemistry Institute at Russia's Academy of Sciences and Biological Scientific Research Institute of the St. Petersburg University; UDC 574.64]

[Abstract] The ability of heavy metal ions—the most common contaminants in the hydrosphere which cause numerous reactions in natural ecosystems at the cell and population level, e.g., the development of morphological anomalies in cyanobacteria and algae—to serve as environmental condition indicators and thus help resolve the issue of the mechanisms of heavy metal ions' impact on cyanobacteria and the character of their primary contact with cells prompted a study of the cyanobacteria sensitivity to the toxic effect of zinc sulfide. To this end, the *Anabaena variabilis Kuetz* strain CALU 787 from the collection of the St. Petersburg Biological Institute was examined due to this genus proliferation in stagnant water. The culture was grown in liquid medium No. 1 in 50 ml bulbs at a 25°C temperature with round-the-clock light at a 2,000 lx medium level. The experiment procedure is outlined. The data reveal three types of zinc ion impact on the culture growth: stimulated growth for 5 days (at 0.001 ml/g or 0.1 MPC), a prolonged lag phase after which the growth rate is the same as in the control group (at 0.01 ml/g or 1.0 MPC), and a drop in the cell density, especially in the steady-state growth phase (at 0.02-0.2 ml/g or 2-20 MPC). Both the growth inhibition and stimulation were equally treated as undesirable phenomena since any deviation from natural productivity is quite dangerous for aquatic ecosystems. The *A. variabilis* cell population behavior under various concentrations of zinc ions is plotted. The results confirm the *A. variabilis* high sensitivity to Zn ions. At zinc ion concentrations above 5.0 MPC, intensive trichome fragmentation, morphological anomalies, and irreversible ultrastructural defects of the photosynthesis apparatus were observed. A 20 MPC concentration is lethal for *A. variabilis*. It is speculated that the morphological anomalies under some experimental conditions are not caused by the specific effect of zinc ions, and may be used as bioindicators of the habitat. Figures 2; references 9: 8 Russian, 1 Western.

Radioecological Studies in Kiev Reservoir Littoral Zone Before and After Chernobyl Nuclear Power Plant Accident

947C0156C Kiev GIDROBIOLOGICHESKIY ZHURNAL in Russian Vol 29 No 3, May-Jun 93 pp 100-109

[Article by I.V. Pankov, Ye.N. Volkova, Z.O. Shirokaya, Hydrobiology Institute at the Ukrainian Academy of Sciences, Kiev; UDC [(577.34:574.5):621.31](282.247.32)]

[Abstract] Radioecological studies of the Kiev reservoir's littoral zone conducted both before (1979-1986) and after (1986-1991) the Chernobyl nuclear power plant accident are reviewed, and the importance of the littoral areas due to the development of a many aquatic plants and invertebrates is stressed. A comparison of the radionuclide accumulation levels and parameters in the littoral component would make it possible realistically to assess the impact of radiative contamination, understand the radionuclide dynamics in abiotic and biotic components, and identify the radionuclide accumulation traits in hydrobionts at various trophic levels under the conditions of global and accident-related radioactive contamination of plain reservoirs. The study methods and materials and sampling procedures are outlined. The radionuclide concentration was measured by radiochemistry and γ-spectrometry methods using an instrument consisting of a DGDK-40A detector, a system of Vektor input modules, and AI-4096-A90 amplitude analyzer. The concentration of long-lived radionuclides (^{90}Sr and ^{137}Cs) in the ecosystem components in 1979, the accumulation coefficients, contribution, and ratio of long-lived radionuclides in the ecosystem components in 1979, the contribution of ^{90}Sr and ^{134}Cs+^{137}Cs to the total radioactivity of ecosystem components in 1986-1991, and the radionuclide accumulation coefficients in the ecosystem components in May-Jun 86 are summarized. The study shows that the radionuclide concentration dynamics are due to the washing out of radioactive elements from the 30 km zone around the nuclear plant and depend on the complex hydrological and hydrochemical processes in the estuary of the Pripyat river and littoral zone. Since 1987, strontium made a dominant contribution to the radionuclide content in the water and mollusks while cesium has been detected in fish since mid-1986 and in higher aquatic plants—since 1988. Figures 4; tables 4; references 4.

Environmental Monitoring System of Natural Water Conditions

947C0156B Kiev GIDROBIOLOGICHESKIY ZHURNAL in Russian Vol 29 No 3, May-Jun 93 pp 88-95

[Article by S.V. Kreneva, Azov Scientific Research Institute of Fishery Industry, Rostov na Donu; UDC [593.17:574.63](08)(28)]

[Abstract] The widening gap between the rates at which new contaminants appear the maximum permissible concentrations (PDK) are developed for them and the impossibility of reliably extrapolating the experimental observation data to natural reservoirs made MPCs irrelevant in today's toxicology studies and called for conducting environmental research at the biocenosis level. Thus, only standards and forecasts developed on the basis of studies of natural biocenosis under natural conditions may be regarded as reliable, especially since the man-caused factor has become a customary event in such research. As a result, methods are proposed of establishing MPCs not from test-tube data but for the specific ecosystem and the pollution sources which affect it. The proposed system of biological analysis and monitoring methods was refined in large bodies of water with a powerful current system, i.e., Ladoga, Onega, and Baykal lakes. A block diagram of such biological analysis under complex hydrological conditions is cited, and the contaminated flow ecosystem dynamics are plotted. The systemic approach used is divided into three phases. The biological analysis system's concluding stages involve setting the standards for the man-caused burden and establishing monitoring and prediction methods for use in the most severe cases, i.e., large bodies of water. The system may be simplified considerably for smaller reservoirs with a less complicated hydrological conditions while maintaining the principal analysis premises. Figures 2; references 10: 8 Russian, 2 Western.

Hydrobiological Characteristics of Gulf of Finland's Neva Bay

947C0156A Kiev GIDROBIOLOGICHESKIY ZHURNAL in Russian Vol 29 No 3, May-Jun 93 pp 3-14

[Article by A.F. Alimov, V.N. Nikulina, V.Ye. Panov, I.V. Telesh, N.P. Finogenova, Zoology Institute at Russia's Academy of Sciences, St. Petersburg; UDC 574.5(282.247.21)]

[Abstract] Concerns that the 22.2 km dam and flood protection barriers along the St. Petersburg sea front will aggravate the already strained environmental conditions in the Neva bay and eastern end of the Gulf of Finland necessitated a comprehensive evaluation of the bay's hydrobiological characteristics. To this end, staff of the Fresh Water and Experimental Hydrobiology Laboratory of the Zoology Institute at Russia's Academy of Sciences in St. Petersburg carried out hydrobiological research aimed at clarifying the bay ecosystem functioning. In so doing, the phytoplankton and chlorophyll concentrations are studied on the basis of the 1984-1989 and 1992 data; the phytoplankton sedimentation samples are processed using conventional hydrobiological procedures, and the chlorophyll concentration is measured in acetone extracts with the help of a spectrophotometer. The sampling procedure is outlined. The findings reveal that the Neva river estuary is characterized by a twin-peak seasonal phytoplankton dynamics curve with the aquatic plant biomass maximum of up to 15 mg/l in the spring. The blue-green, green, and diatom algae are dominant during the summer and fall period. The average zooplankton population and biomass in the Neva river bay in June of 1984 and 1991, Shannon's diversity index in the oligochete colonies in various sections of the Neva bay, and the oligochete biomass in the Neva bay are summarized. The study of the hydrobiont colony structure and functioning reveals that the significant changes which occurred during the 1984-1991 period reflect the continuing water contamination and changes in the hydrological conditions which are attributed to seawall construction. The need for further long-term systematic observations and a special estuary ecosystem monitoring program is stressed. A negative trend whereby research budgets are being cut is noted. The prerequisites for stabilizing the environmental conditions in the Ladoga, Neva, Neva bay, and Gulf of Finland system are formulated. Figures 5; tables 3; references 17.

PHARMACOLOGY AND PHYSIOLOGY

Functional Activity of Monocytes and Nonspecific Antiviral Cell Resistance During Adaptation to Eastern Siberian Conditions

947C0171A Moscow KLINICHESKAYA LABORATORNAYA DIAGNOSTIKA in Russian No 6, Nov-Dec 93 pp 65-68

[Article by Ye.B. Zhiburt, L.V. Filev, M.P. Boychak, I.V. Volchek, G.P. Yakovlev, Hematology and Clinical Immunology Department at the Military Medical Academy imeni S.M. Kirov, St. Petersburg; UDC 616.2-036.11-092:612.112.95]

[Abstract] The high morbidity, primarily acute respiratory organ disease (OZOD), characterizing adaptation to the conditions in Eastern Siberia and the viral bronchial-pulmonary pathology factors whereby the mononuclear phagocyte system (SMF) serves as the central mechanism of the organism's immunity and nonspecific resistance engendered interest in the functional activity and nonspecific antiviral resistance of mononuclear phagocytes to the climatic conditions in Eastern Siberia. A study involved 18-23 year old men who came in November-December from USSR's European part to work in Trans-Baykal; the sample consisted of 135 patients divided into three groups and a control group of 46 men. The functional activity of monocytes was examined in

an integral test with tetrazole nitro blue. The experimental procedure is outlined. The functional activity of monocytes among newcomers suffering from acute respiratory organ diseases and the nonspecific antiviral cell resistance to acute respiratory organ diseases among the newcomers are summarized. The study demonstrated that adaptation to the conditions of Eastern Siberia is related to changes in the functional activity of monocytes and intracellular virusemia in monocytes and lymphocytes but revealed no significant changes in the metabolic and phagocytic activity of monocytes during acute pneumonia and bronchitis whereby the degree of viral damage to monocytes serves as the determining factor. The antiviral monocyte resistance indicators are the most significant adaptation criteria. Tables 2; references 10.

Effect of Certain Cryoprotectors on Water State in *Yersinia Pestis* EV76 Cells During Freezing-Thawing

947C0011A Kiev PROBLEMY KRIOBIOLOGII in Russian No 4, Jan-Mar 93 pp 20-26

[Article by A.N. Terentyev, A.V. Zinchenko, V.D. Zinchenko, V.I. Musatov, M.I. Shchetinskiy, Cryobiology and Cryomedicine Problems Institute at the Ukrainian Academy of Sciences, Kharkov, and Rostov-on-Don Scientific Research Antiplague Institute; UDC 541.64-14.152.2:57.043]

[Abstract] Interest in the state of water in biological systems under deep cooling and a lack of systematic studies of the effect of various types of cryoprotectors on water's nonfreezing component in the cells prompted an attempt to determine experimentally the quantity of nonfreezing water in a suspension of *Yersinia pestis* EV76 cells in the presence of both penetrating and nonpenetrating cryoprotectors and study the process of this component congelation with a decrease in the specimen temperature. The *Y. pestis* EV76 plague microbe is selected mostly due to the fact that preparation of the *Y. pestis* EV76 vaccine strain involves freezing in a protective medium and lyophilic drying. The *Y. pestis* EV76 vaccine strain of the NIIEG line is used in the experiment. The bacteria were grown on a solid nutrient medium at a 28°C temperature for 48 h. The experimental procedure is outlined. Nuclear magnetic resonance spectra were recorded by a BS 567 A high resolution Tesla spectrometer at a 100 MHz working proton frequency. The dependence of the NMR water signal strength on the temperature in the suspension of *Y. pestis* EV76 cells without and with a cryoprotector and in a system containing bacterial cells and the temperature curves of the cryoptotectant solutions are plotted. The dependence of the nonfrozen water NMR signal strength on the temperature in the *Y. pestis* EV76 bacteria suspensions and in various cryoprotector media and the phase transition and congelation temperatures in cryoprotective media under various cooling and heating conditions are summarized. The study carried out within a 0 to -40°C temperature range with the help of the differential scanning calorimetry method reveals that the total amount of nonfreezing water within a range between congelation and melting points in cell suspensions with various cryoprotectors does not follow the simple additivity law with respect to the sum of hydration numbers of individual components. The findings attest to the complex effect of multicomponent protective media on the state of water's nonfreezing fraction in cell suspensions and point toward the possibility of producing material in a congealed state. This makes it necessary to determine the waster state at low temperatures experimentally in each specific case and in developing cryobiological practices, yet the congelation temperatures found in the study can be used for selecting optimum long-term *Y. pestis* EV76 cell specimen storage temperatures. Figures 2; tables 2; references 10: 8 Russian, 2 Western.

Effect of NAD on ^{14}C-GABA Binding and Release After Convulsant Drug Injection

947C0147B Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 39 No 4, Jul-Aug 93 pp 48-50

[Article by A,I, Fomenko, S.P. Stepanenko, P.K. Parkhomets, G.V. Donchenko, Biochemistry Institute imeni A.V. Palladin at the Ukrainian Academy of Sciences, Kiev; UDC 612.822.2.014.46:615.221]

[Abstract] A lack of clear understanding of the specific role of the inhibitory system in the GABA-ergic system involvement in the development of neurological diseases manifested in seizures and paroxysms and a lack of data on whether the pre- or postsynaptic system participates in the mediated effect of NAD on the GABA-ergic transmission whereby nicotinamide competes for the benzodiadepin binding segments through NAD and reinforces the GABA-ergic system prompted an attempt to answer these questions. To this end, an experiment was carried out on 120-150 g male rats which were injected with nicotinamide intraperitoneally based on a 150 mg per 1 kg ratio twice a day for one week. Corazol was administered to control animals or against the backdrop of 30 mg/kg nicotinamide injection 50 s prior to decapitation. The experimental procedure is outlined. The NAD and γ-aminobutyric acid (GABA) concentration in the rat brain cortex, the effect of NAD on the dynamics of ^{14}C-GABA binding by control animal synaptosomes, the effect of NAD on the dynamics of ^{14}C-GABA binding synaptosomes after a corazol injection, and the curve of ^{14}C-GABA release by the synaptosomes are plotted. The findings show that convulsion-inducing drug injection to intact animals leads to a NAD and GABA level decrease by 23 and 20% even 50 s after the start of seizures whereby this effect is not observed after the additional nicotinamide injection. The study reveals and NAD concentrations triggering the inhibitory effect on GABA accumulation by the synaptosomes have no effect on GABA release. The conclusion is drawn that systematic administration of nicotinamide accompanied by an increase in the NAD and GABA level helps to restore the postsynaptic inhibitory effect of GABA under

stress. Moreover, the effect of NAD on the GABA-ergic transmission is primarily realized at the postsynaptic level according to data on the impact of NAD on the inhibitory neurotransmitter binding and release systems. Figures 5; references 18: 3 Russian, 15 Western.

Thymus and Tumor 5'-Nucleotidase Activity After Bradykinin Injection to Tumor-Bearing Mice

947C0146A Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 39 No 2, Mar-Apr 93 pp 13-15

[Article by G.A. Sukhanova, G.V. Potapova, S.A. Narbutovich, Tomsk Medical Institute; UDC 616.438-008.931-02:615.225.2]-07]

[Abstract] The catalytic activity of 5'-nucleotidase (5'-ribonucleotide phosphohydrolase), a lipid-dependent enzyme of the cell plasmatic membrane, which is manifested in hydrolyzing extracellular AMP and the formation of extracellular adenosine, and the properties of bradykinin—a vasoactive peptide capable of stimulating the thymus cell division and inhibiting the thymocyte membrane lipid peroxidation—whose effect on the state of tumor cells is relatively unknown prompted an investigation into the activity of the thymus and tumor cell 5'-nucleotidase after bradykinin injection to mice during the development of allogenic and syngenic transplanted tumors with different proliferation stimulant effects. To this end, BALB/c and noninbred 18-22 g mice were used in the experiment. The former mice were inoculated with P-815 macrocytoma (syngenic for the H-2D hystocompatibility complex) while the latter were subcutaneously injected with allogenic Crocker sarcoma. Bradykinin triacetate was administered intravenously after seven days to both groups. The 5'-nucleotidase activity was measured by the inorganic phosphate formation as a result of the 5'-AMP hydrolysis. The experimental procedure is outlined. The 5'-nucleotidase activity in the mice thymus after the bradykinin injection and the number of tumoral node cells after the bradykinin injection at the tumor development stage are summarized, and the activity of thymus and tumor cell 5'-nucleotidase after the bradykinin injection to tumor-bearing mice is plotted. Bradykinin injection to intact mice leads to a considerable increase in the thymus cell 5'-nucleotidase activity, peaking after 6 h; the effect of the bradykinin injection on the allogenic and syngenic tumors differed. The study shows that bradykinin stimulates the 5'-nucleotidase activity in the thymus of tumor-bearing mice while the effect of bradykinin on the tumor cell enzyme activity is less marked, especially under syngenic conditions. It is noted that the 5'-nucleotidase activity is a rather informative indicator of the thymus cell status which characterizes the tumor cell sensitivity to bradykinin. The study of the 5'-nucleotidase activity may be used for assessing the effect of antitumoral preparations under experimental conditions. Figures 1; tables 1; references 6: 4 Russian, 2 Western.

Protective Response of Brain Cells To Change in Hematoencephalic Barrier Permeability

947C0147A Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 39 No 4, Jul-Aug 93 pp 25-27

[Article by A.P. Khokhlov, I.G. Fetisova, A.M. Podlesnyy, V.P. Chekhonin, V.K. Malakhovskiy, Moscow Medical Academy imeni I.M. Sechenov and Moscow Scientific Research Institute of Psychiatry imeni V.P. Serbskiy; UDC 616.831.9-008.6-092:612.017.1]-07]

[Abstract] Reports of changes in the hematoencephalic barrier (GEB) permeability and the appearance of neurospecific proteins (NSB) in the blood accompanied by the formation of antibodies which threaten the brain with an autoimmune impairment and the impact of protein-synthesizing process activation in the glial cell on the performance of the protective mechanisms aimed at alleviating possible pathological consequences against the background of a rise in the hematoencephalic barrier permeability prompted an attempt to verify the above assumptions. To this end, the dynamics of the specific glial proteins and antibodies to them in the blood of patients after neurosurgery are studied. To this end, 23 patients divided into two groups—14 with a verified brain tumor (principal group) and 9 in the control group—aged 35 to 45 are examined. The anesthetic procedure and research methodology are outlined. Brain α_1- and α_2-globulines, α_2-glycoproteid, gliofibrillary antigen, and antibodies to them were examined; the number of neurospecific proteins and autoantibodies to them were determined by immunoferent methods and recorded by a multispectral Titerteck Multiskan spectrophotometer (by Flow, U.K.). Statistical data are processed using the Wilcoxon-Mann-Whitney nonparametric criteria. The neurospecific protein concentration in the blood of the principal and control groups against the background of anaesthesia and during the postoperative period is summarized. A high neurospecific protein level is measured in the blood of most of the principal group patients during the preoperative period; it is speculated that the antiendematic drugs used before the surgery facilitated an increase in the hematoencephalic barrier permeability. Similar results were obtained in the control group. The conclusion is drawn that anaesthesia is the leading factor affecting an increase in the hematoencephalic barrier permeability to neurospecific proteins in the blood→brain direction whereby the neurospecific protein dynamics make it possible to speculate that the glial protein synthesis is enhanced under the effect of anaesthesia. It cannot be ruled out that a massive neurospecific protein influx into biological fluids against the backdrop of dehydrating therapy, alcohol intake, neurolepsy, and traumatic brain injury generate the protective response preventing the autoimmune brain impairment. Tables 2; references 11: 3 Russian, 8 Western.

NAD Interaction With Rat Brain's GABA-Ergic System

947C0146B Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 39 No 2, Mar-Apr 93 pp 21-23

[Article by A.I. Fomenko, P.K. Parkhomets, G.V. Donchenko, S.P. Stepanenko, Biochemistry Institute imeni A.V. Palladin at the Ukrainian Academy of Sciences, Kiev; UDC 616.831-008.934.663-092.9-074]

[Abstract] The consequences of disruptions in the functioning of the brain's GABA-ergic system, such as epilepsy, Parkinson's disease, schizophrenia, etc., reports confirming the so-called γ-aminobutyric acid (GABA) hypothesis of epilepsy and convulsive paroxysms, and the findings indicating that some NAD-dependent dehydrogenases can lower the nicotinamide coenzymes in the blood prompted an examination of the anticonvulsant mechanism of nicotinamide and to investigate the response of the principal inhibitory mediating system to the effect of NAD. To this end, an experiment was carried out on 150 g male albino rats, and corazol was injected intraperitoneally based on a ratio of 30 mg per 1 kg of body weight 50 s, 2 and 10 min, and 3 h before decapitation. The experimental procedure is outlined. The effect of MAD on the specific ^{3}H-muscimol binding is summarized, and the dynamics of ^{14}C-GABA capture by the rat brain synaptosomes are plotted. Allowing for known data on the nicotinamide interaction with the GABA-benzodiazepin receptor complex and the findings of this study, the conclusion is drawn that the pharmacological effect of nicotinamide used for clinical treatment of epileptic seizures may be realized through NAD which activates the GABA receptors, thus facilitating the GABA-ergic transmission. In affecting the terminal stage of postsynaptic action of the inhibitory neurotransmitter, NAD is capable of inhibiting the synaptosomal capture of ^{14}C-GABA just like the capture inhibitors which are efficient anticonvulsant drugs. Figures 3; tables 1; references 18: 5 Russian, 13 Western.

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